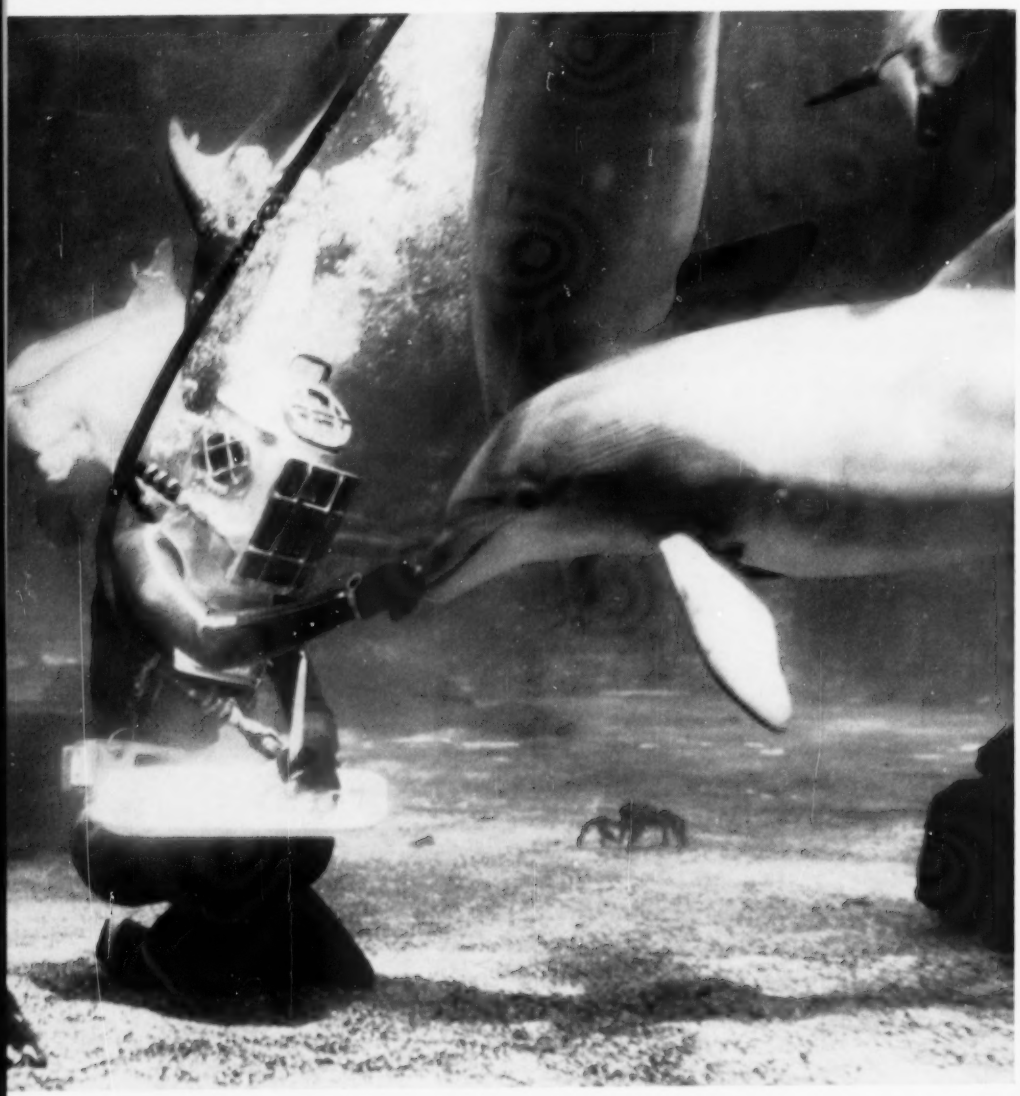
Compressed Air Magazine

FEBRUARY 1956

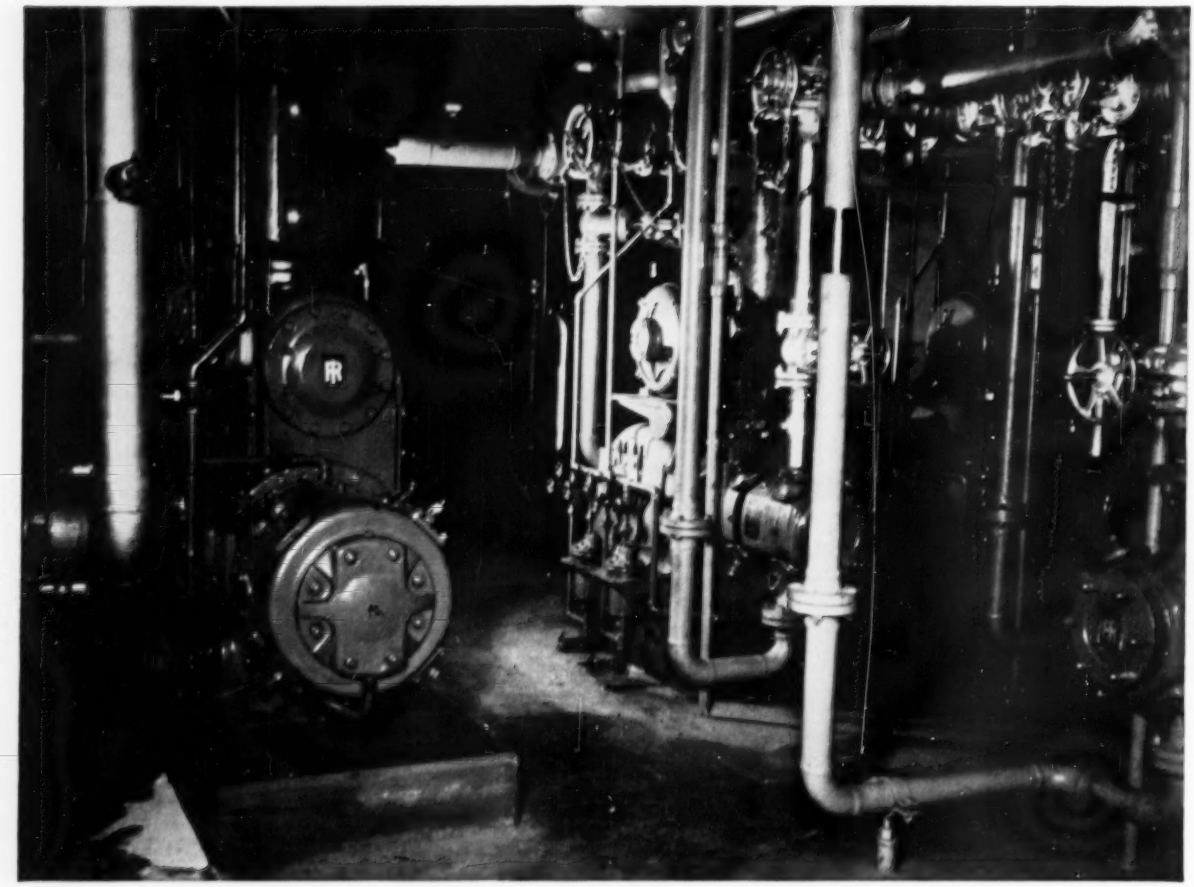


LUNCH TIME AT NEW AQUARIUM

Porpoise munches birthday "cake" during party at Pacific Marineland

(SEE INDEX PAGE)

VOLUME 61 • NUMBER 2 NEW YORK • LONDON



Better performance ...lower costs

When air compressors are lubricated with *Texaco Regal Oil R&O* you can be sure of: (1) clean, rust-free systems and lines, (2) full compression, (3) dependable, trouble-free performance. Over-all results: more efficient operation, lower maintenance costs.

The *Texaco Regal Oil R&O* series is premium-quality, especially refined, with effective additives to inhibit oxidation and rusting. It has the high oxidation resistance needed to prevent sludge formation and harmful deposits. It keeps discharge passages clear, valves working properly, and the entire system free from rust.

There is a complete line of *Texaco Regal Oils R&O* to meet the requirements of all types and sizes of compressors, and all operating conditions. A Texaco Lubrication Engineer will gladly give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Circle 1A on reply card

STAYNEW

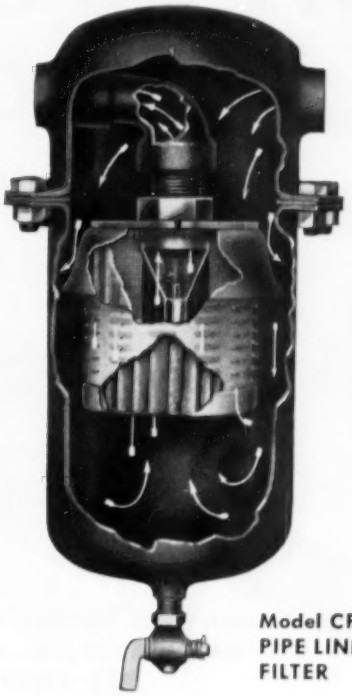
PIPE LINE FILTERS

FOR

CLEAN DRY AIR

IN

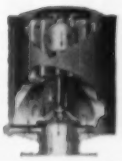
- AIR OPERATED INSTRUMENTS
- AIR OPERATED TOOLS
- PNEUMATIC CONTROLS
- INDUSTRIAL PROCESSES



Model CPH PIPE LINE FILTER

MODEL CPH PIPE LINE FILTER has exclusive Staynew "double action principle." Air is first deflected to outer walls of filter and forced downward at high speed. Water, oil and heavier particles of rust, etc., are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This double action design eliminates need for frequent cleaning.

Inexpensive, simple to install and maintain, Staynew Pipe Line Filters keep your air-operated equipment free from the destructive effects of pipe scale, dust, dirt, and condensates. And, Staynew Filters pay for themselves in reduced equipment maintenance costs alone. They filter compressed air under all pressures and temperatures, natural and manufactured gases. Dollinger engineers will welcome your filtration problems. Why not call on us. Remember, Dollinger *makes* every type of filter for every industrial need.



INTAKE FILTERS

LIQUID FILTERS

PIPE LINE FILTERS

ELECTRO-STAYNEW PRECIPITATOR

AUTOMATIC AIR FILTERS

PANEL FILTERS

SPECIAL FILTERS

DOLLINGER PROTECTION WITH STAYNEW FILTERS

DOLLINGER CORPORATION

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

Write for Bulletin 200 which contains complete engineering data and illustrated material on Staynew Pipe Line Filters. Dollinger Corporation, Dept. 7, Centre Park, Rochester 3, N. Y.

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
ELECTROSTATIC FILTERS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS
VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS
AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Circle 2A on reply card

NEW!

Revolutionary AIRengineering Development by Ingersoll-Rand . . .

TORSION BAR

Torque control

IMPACTOOL

FOR HEAVY NUT RUNNING

MULTIPLE TORQUE SETTINGS
MAXIMUM TORQUE—550 FT. LBS.
SIZE 5340T

. . . how can YOU use these OUTSTANDING ADVANTAGES?

Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress preset in the torsion bar.

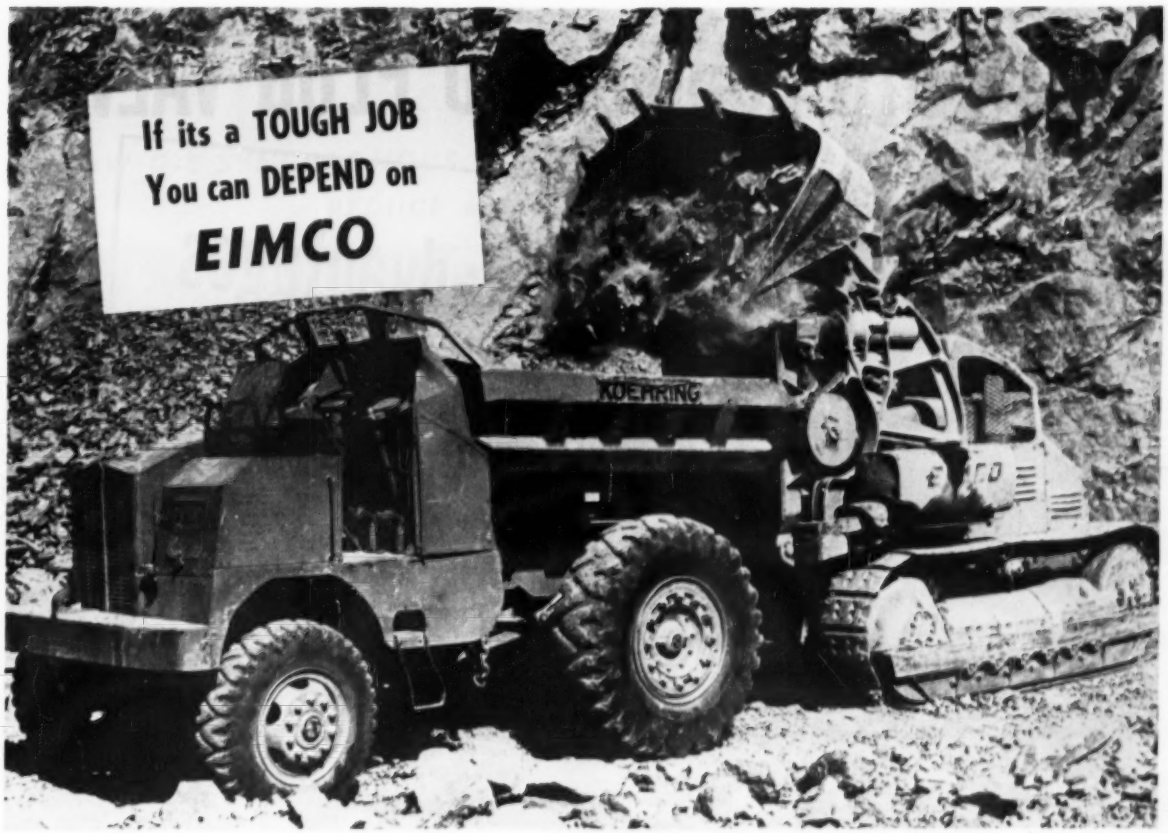
- Write, phone or wire for a free demonstration . . . or write direct for full information on this revolutionary AIR-engineering development.

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES SPECIAL TEST FACILITIES**
- **NO NEED FOR PRESSURE REGULATORS**—Impactool operates at full power and speed.
- **NO OPERATOR TRAINING**—Torsion Bar *Torque Control* does not rely on operator's sense of timing.

Ingersoll-Rand

Air Tool Division
11 Broadway, New York 4, N.Y.

8-306



Hard, Rough, Tough Jobs Need Eimco Dependability

This case study concerns one Eimco 105 loader on which an open pit mine depends for its entire production.

Location — in an isolated and remote area of Southwest Africa.

Conditions — dusty, dry and hot. Pit floor uneven-solid rock.
Mining — selective
Operators — native
Maintenance — Nil

Report — The Eimco 105 Tractor Excavator has operated some 3200 hours on consecutive two shift basis under the most difficult conditions. Native operators are unnecessarily abusive of the equipment. The ore is exceptionally abrasive and heavy. No other loading equipment is available so the Eimco must stay on the job. One operator ran the 105 a complete shift without fan belts, both of them run the machine to the solid rock wall and spin the tracks when cleaning out an ore pocket.

Eimco does not recommend abuse on their tractor-excavators or any other equipment but Eimco produces a machine that can stay on the job day in and day out—month in and month out—when you are depending on it and when plant capacity depends on a single production loading unit.

There are many reasons for Eimco superiority on the tough jobs. The design of an Eimco is simple-strong. The material of construction is all alloy steel. The operating features make it the easiest tractor to operate and the most maneuverable. When you need guts in a tractor, compare an Eimco with anything you are using or have used previously.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-173

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . . Made in a complete line. Sizes from ½" to 30" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

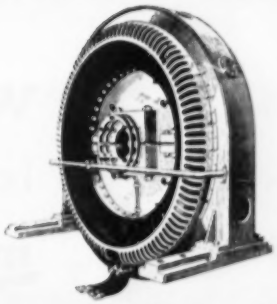
For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

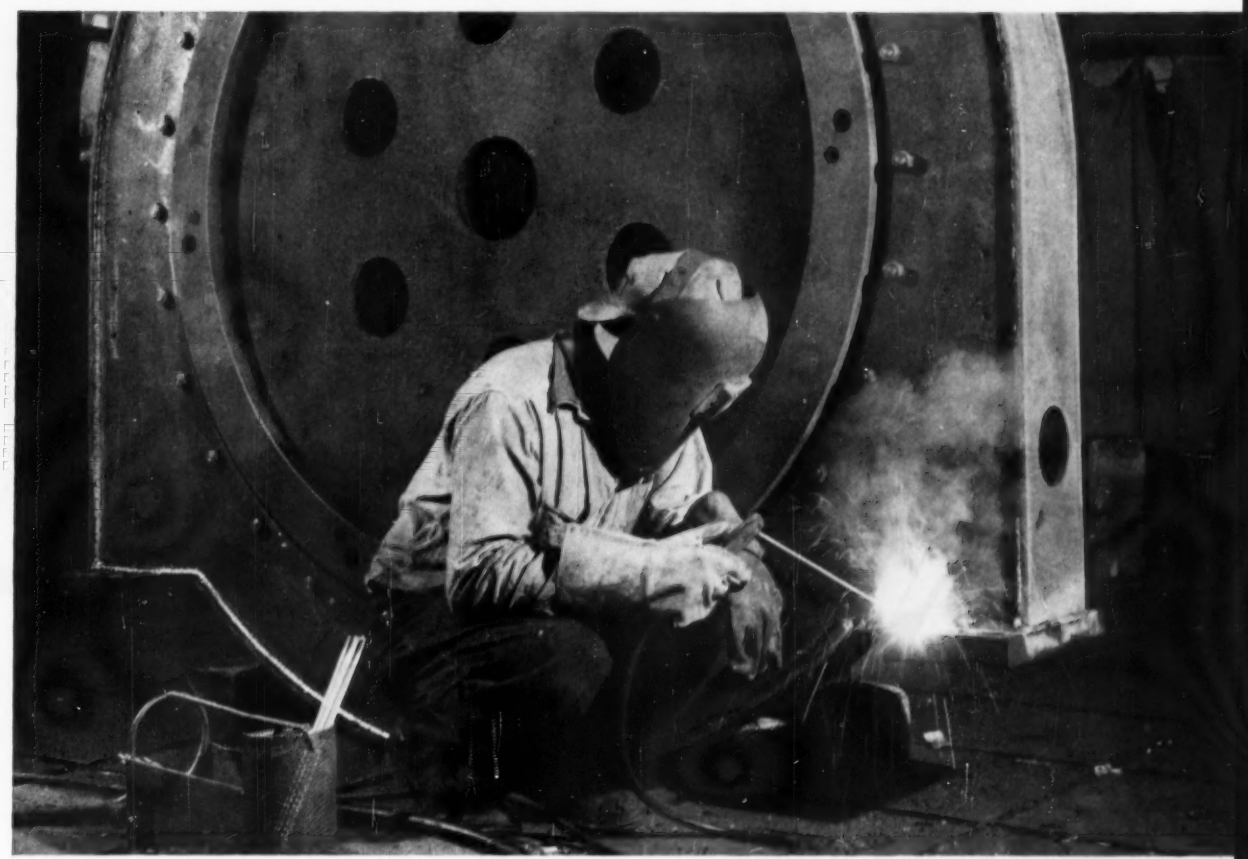
valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



HOW G-E SYNCHRONOUS MOTORS REDUCE MAINTENANCE COSTS



STATOR FRAMES FOR G-E LOW-SPEED SYNCHRONOUS MOTORS ARE WELDED WITH A CONTINUOUS DEEP FILLET WELD

Fabricated motor frames last longer!

G-E design engineers pioneered in developing welding techniques for fabricating low-speed synchronous motor frames. For many years they have felt this type of construction, combined with G.E.'s research and manufacturing skills, would produce motors capable of delivering long, highly dependable service in heavy-duty applications.

The results? After twenty years and millions of operating hours, welded steel frames have proved they make a tough, rigid motor. These G-E low-speed synchronous motors are giving service in such demanding installations as pulp grinders, air compressors, wood chippers, ball mills, jordans and rolling mills.

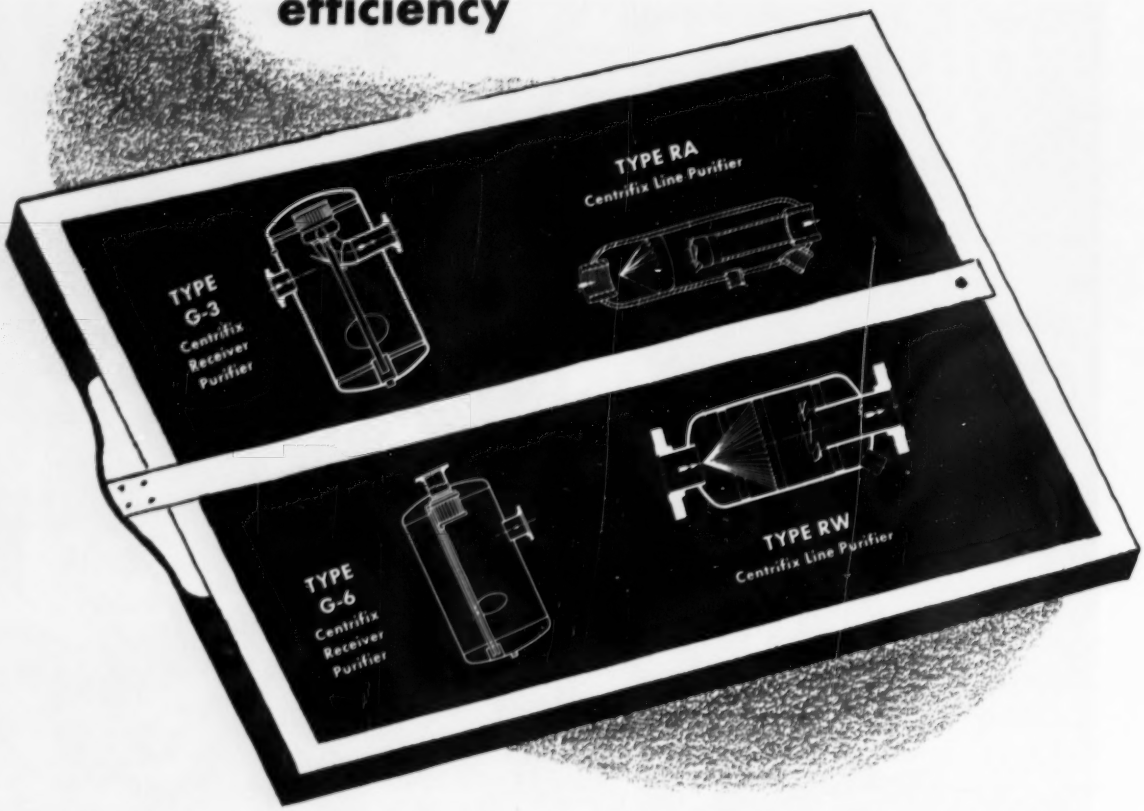
These motors have shown they can better withstand the severe operating conditions of such installations. This means you save money by avoiding costly downtime.

The *next time* you consider a synchronous motor drive, contact the nearest G-E Apparatus Sales Office. A sales engineer will be glad to explain the many advantages of G-E equipment. Or, if you prefer, write for GEA-5332, "Low-Speed Synchronous Motors." Address Section 770-39, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Wherever Compressed Air is used Centrifix Purifiers are a must for highest operating efficiency



Dust, dirt, water and rust are completely removed from compressed air by Centrifix Receiver and Line Purifiers with high efficiency and negligible pressure drop.

Centrifix Type G Receivers purify inlet air. Internal Receiver Purifiers are available for units already installed.

Liquids are removed between compression stages for greater efficiency by two types of Centrifix Line Purifiers: Type RA for horizontal or downflow service in pressure ranges up to 400 psi and Type RW for use in pressure lines to 600 psi. This entrainment separation is accomplished by correct application of centrifugal and centripetal forces initiated by basic design.

Write today for Centrifix Engineering Manual and Catalog

Centrifix Purifiers completely remove liquids produced by condensation from compressed air prior to its use in air-driven tools and machinery and from air dried by chemical driers. This separation both increases the efficiency and prolongs the life of chemical driers.

Centrifix engineers are prepared to survey your requirements and recommend specific equipment . . . without obligation.

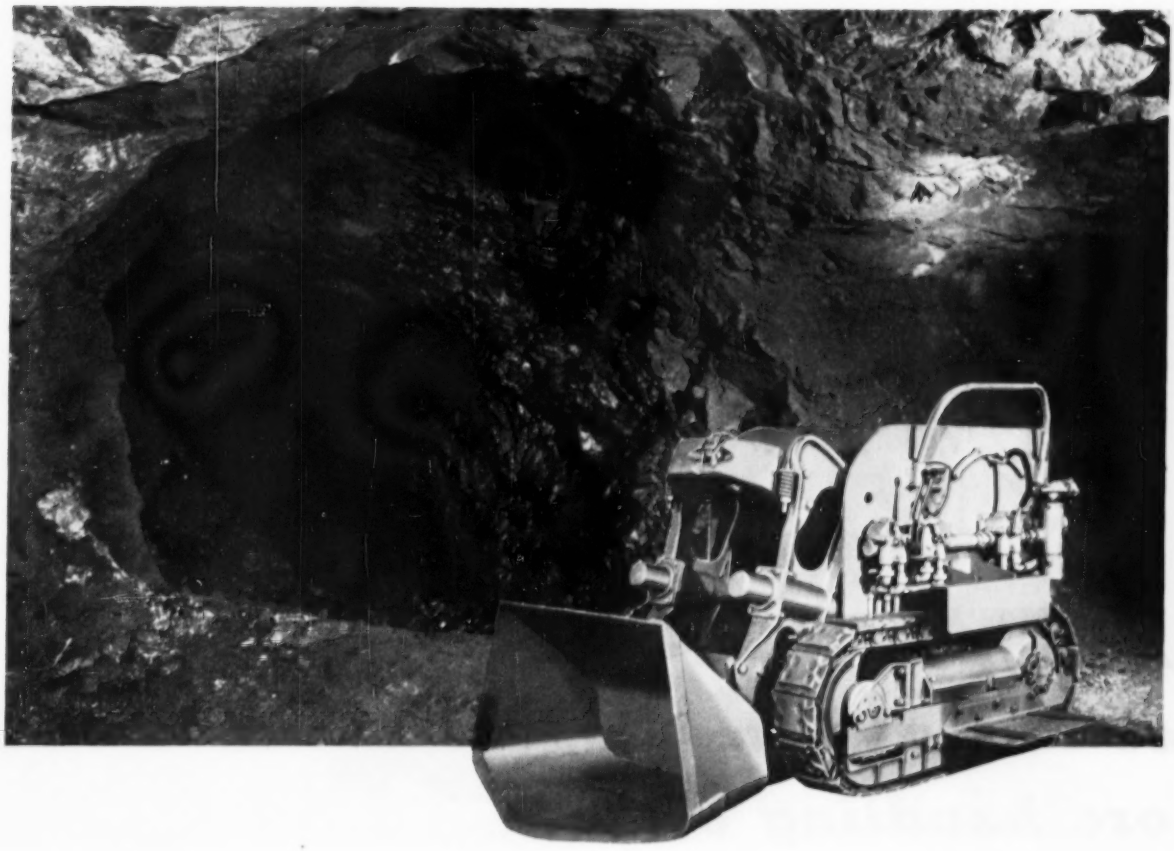
THE

Centrifix

CORPORATION

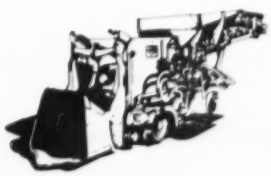
3606 PAYNE AVENUE
CLEVELAND 14, OHIO

Circle 7A on reply card



12B LOADER

21 LOADER



40H LOADER

THINKING OF REOPENING AN OLD PROPERTY?

Several good mining properties, unoperable only a few years ago, have taken on a new look with present day metal prices.

The cost of setting up to do business has many a mining man weighing the cost against the advantages.

New equipment available today offer many advantages for this work. The Eimco 630 crawler loader for trackless mining provides the ultimate in dependable loading equipment where it is not economical to relay track.

Investigate this sturdy loader — weight approx. 10,000 pounds — 3 tons per minute — operating and maintenance costs less than 1c per ton loaded.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

EIMCO

B-180

The "Lohed's" simple, rugged construction is evident in this view of the car in dumping position (with end cover removed).

Designed to reduce your ore handling costs

75 years experience aimed at one goal—reduce ore handling costs. That's the design and development story of Lake Shore's complete line of mine cars and related ore handling equipment.

Here's a typical example of this development . . . the "Lohed" mine car. With all welded construction it stands up better than the old rivet type car under the hard knocks of everyday operation. Its simplified design is strong . . . yet light in weight. Rounded corners add stiffness, prevent ore sticking . . . mean faster, cleaner dumps.

What's more, inspection and maintenance, when it's needed, is a snap. Just pull six pins to remove the car body from the truck.

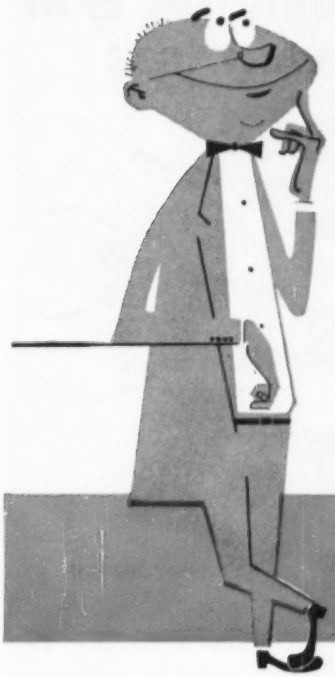
Features like these add up to greater production, less down-time, lower maintenance costs, *reduced ore handling costs*. This advanced thinking is engineered into every Lake Shore car—standard and special models. Before you buy, talk to the people at Lake Shore and see how these advantages can be applied to your operation, to help you move more ore at lower cost.

LAKE SHORE, Inc.

Lake Shore Engineering Division

IRON MOUNTAIN 10, MICHIGAN

BEARING TROUBLES?



NO SIR! Not with new Reliance Motors and METERMATIC .... the

Automatic Grease Monkey

I found out how to put an end to burned out bearings from the Reliance Metermatic Bulletin, A-2406. Why don't you write for one? A-1499

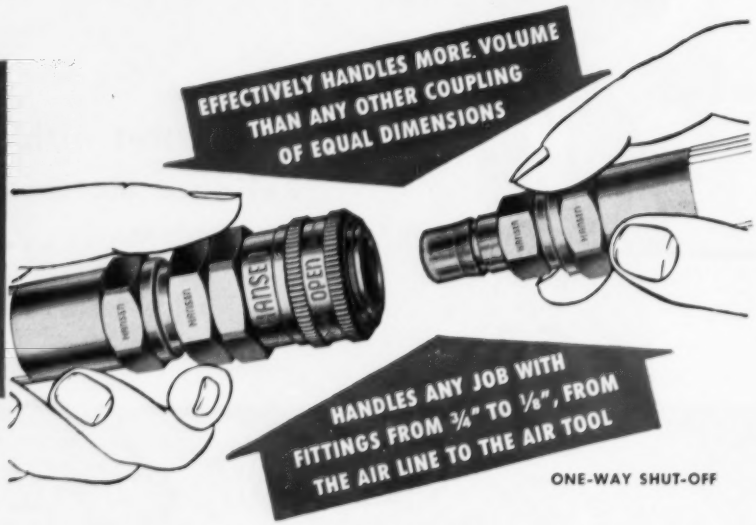
RELIANCE ELECTRIC AND ENGINEERING CO.

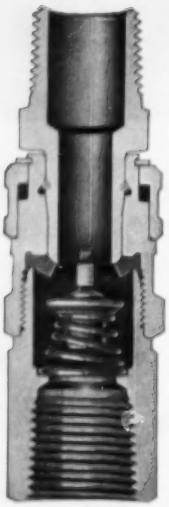
Cleveland 10, Ohio • Offices in Principal Cities

This is it!

THE QUICK-CONNECTIVE PNEUMATIC COUPLING THAT GIVES YOU THESE BIG ADVANTAGES

HANSEN
SERIES 3-RL
RING-LOCK COUPLING

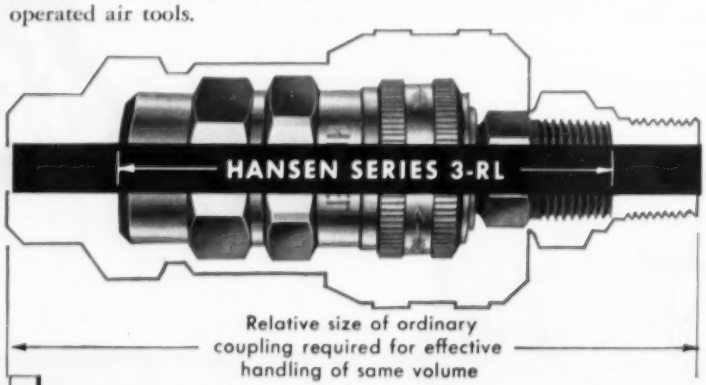




- Smaller—Lighter.
- All Series 3-RL Sockets and Plugs are interchangeable—reduces stock inventory to a minimum.
- Positive Locking.
- Equipped with automatic sleeve lock.

• Compactly designed, the Hansen Series 3-RL Coupling *effectively* handles far more volume than any coupling of equal dimensions. On any job requiring ¾" to ⅛" connections—from the air line to the air tool—this single size Hansen Ring-Lock Coupling—with completely interchangeable Sockets and Plugs—does it all—makes it easy to keep stock of parts in balance—holds inventories to a minimum.

To connect, merely push Plug into Socket. To disconnect, just turn the sleeve. Locking ring provides positive lock and assures tight fit. Sockets with aluminum bodies are available for use with small hand-operated air tools.



Write for Descriptive Literature

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

Air hose with tube and cover of NEOPRENE stands up to severe service in mines

Air hose supplying a drill takes a beating from the moment it enters the mine. It's dragged over jagged rubble as the operator drills for a dynamite shot . . . yanked around sharp corners on the way to the next shot. Rough going for *any* hose not constructed with rugged neoprene, Du Pont's chemical rubber.

TOUGH HOSE COVERS of neoprene stand up to pulling and flexing without cracking . . . won't chip or tear on rough surfaces. And neoprene won't spread flame, particularly important in mine operations.

STURDY TUBES of neoprene help avoid slow-ups on the job. They stay firm, flexible . . . resist hot oil in the line. Result: no particles crumble off to clog vital tool parts. Work progresses *on schedule*.

Wherever air hose is used, neoprene gives the braid or fabric reinforcement maximum protection. For work outside the mine, neoprene's resistance to sunlight, heat and weathering gives hose a long lease on life.

DU PONT SUPPLIES neoprene to hose manufacturers who use it in their top-quality lines. Ask your supplier about all kinds of hose with tube and cover of neoprene. He'll be glad to show you how it's built for rugged service.

FREE! THE NEOPRENE NOTEBOOK
Each issue brings you new, unusual applications of neoprene . . . new products . . . interesting articles. Send in this coupon to E. I. du Pont de Nemours & Co. (Inc.), Elastomers Div. CA-6, Wilmington 98, Del.

NEOPRENE
The rubber made by Du Pont since 1932

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division CA-2
Wilmington 98, Delaware

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

Circle 12A on reply card

Using Bethlehem Hollow Drill on U. S. 95, north of Riggins, Idaho. *Excavation Contractor:* Goetz & Brennan, Seattle, Wash.; *Blasting Contractor:* Harding Blasting Co., Portland, Ore. Drill steel and Rok-Bits supplied by Brunner & Lay Corp., Westland Division, Portland.

They Moved 430,000 cu yd of Rock in Straightening Part of Idaho Highway

A narrow, winding section of U. S. 95, in the picturesque mountain country between Riggins and Whitebird, Idaho, was recently relocated by the Idaho Department of Highways. Clearing the way for the 6.7-mi project called for the removal of about 430,000 cu yd of rock. By far the largest percentage of the blast holes were made with Bethlehem Hollow Drill Steel, in 1¼-in. rounds and 1-in. hexagons, fitted with Brunner & Lay carbide-insert Rok-Bits.

The contractor, punching away with jackhammers and wagon drills, drilled blast holes ranging in depth to 30 ft. Although rock conditions varied from very hard to soft basalt, the Bethlehem Hollow performed splendidly.

Bethlehem Hollow Drill Steel is ideal for steady, economical drilling in virtually every type of rock-removal project. This is because it is rolled from an extremely tough, fatigue-resisting steel. Bethlehem Hollow has a wide quenching range, making it an easy steel to heat-treat to obtain the ideal combination of hardness and wear-resistance. It also makes long-wearing threads and rugged shanks.

Bethlehem Hollow is produced in rounds, hexagons and quarter-octagons, and is generally supplied in lengths of from 18 to 25 ft. It can also be furnished in longer lengths to meet special requirements. Give it a trial on your next job!

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL CARBON AND ULTRA-ALLOY

BETHLEHEM STEEL

PUT AIR AT YOUR FINGERTIPS

Button Type—forged brass body; variety of interchangeable noses; easy grip—parts easily maintained.

Lever Type—forged brass body; air controlled from a puff to a breeze; hang-up arrangement; steel lever; comfortable grip; interchangeable noses—easily maintained.

Drop Forged Stainless Steel—withstands hard use; shielded operating button; comfortable grip; countersunk nose; protective hand guard doubles as hang-up hook—parts easily replaced.

Use Schrader blow guns . . . 36 designs and styles

Schrader Blow Guns are made to *fit your hand . . . fit your job!* Schrader Blow Guns are built to take it—here's why:

They're rugged both in design and construction. Bodies are drop-forged either of brass or stainless steel.

They're convenient—can be used anywhere. Blow gun circuits—using Schrader Couplers, Hose and Automatic Hose Reels—take little space, yet put compressed air right at your fingertips.

They're economical—they have few moving parts. And replacement parts, when and if needed, are easily installed.

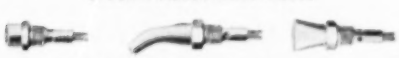
They're versatile—with nine interchangeable noses—both fixed and adjustable—that fit all three standard-type guns, you can't think of a blow-gun application that Schrader can't meet.

It's easy to find out for yourself what a wide selection of blow guns is in the complete Schrader Line of air control equipment. Write today—or, if you prefer, fill out the coupon below.

Schrader
REG. U. S. PAT. OFF.

LEADERS IN AIR CONTROL SINCE 1844

SPECIAL ADJUSTABLE NOSES



VARIOUS STANDARD NOSES

The complete Schrader line of pneumatic accessories includes everything you need

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
478 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. C-2

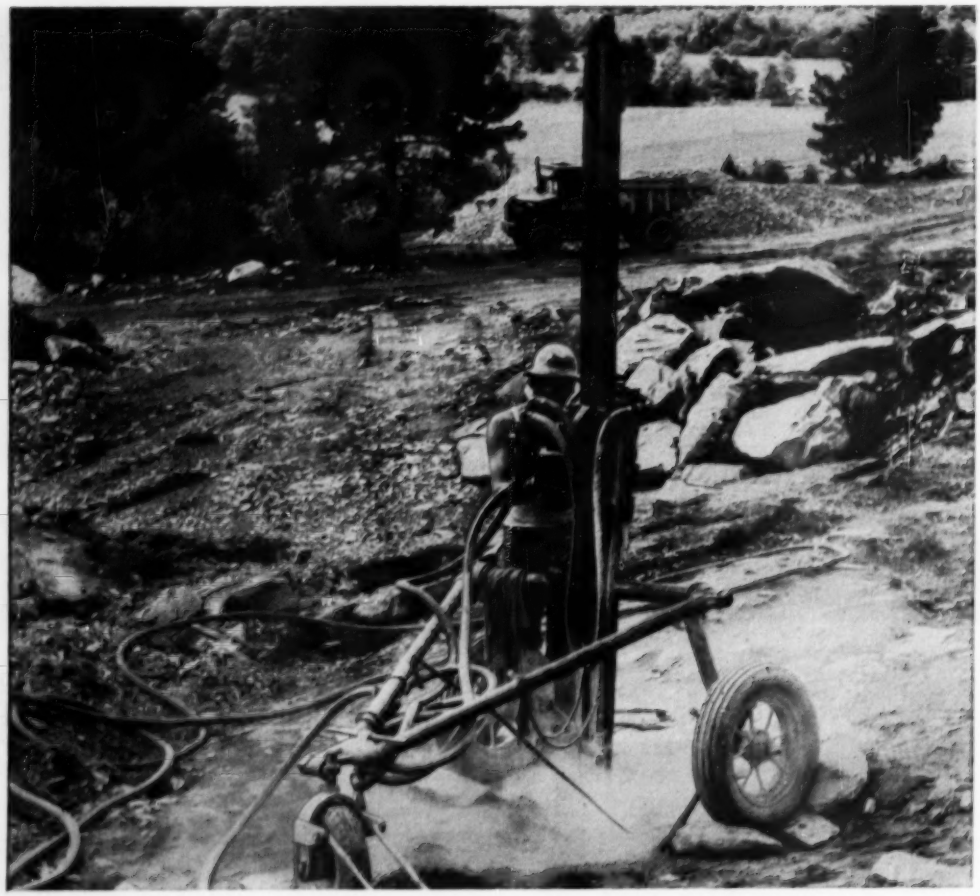
I am interested in more information on _____

Name _____ Title _____

Company _____

Address _____

Circle 14A on reply card



The Wagonjack cuts drilling time in half for scores of jobs. How? Powered forward drill feed, positive feeding pressures, maneuverability, and use of long drill steel. It's a good way to save money. And also to eliminate much of the heavy, tiring work previously performed by manpower.

More than 50 parts strengthened by Nickel Alloy Steels

In Ingersoll-Rand Wagonjack Drill Rigs

THIS EQUIPMENT drills up to 31" per minute through solid granite, depending on air pressure and bit size. It drills at extreme speeds with surprisingly little gage wear. And with a minimum of bit changes.

Look into this WAGONJACK! A real *one-man mounting*, it speeds up work on any job.

You'll find that nickel alloy steels add stamina to more than 50 vital parts of this rig. Ratchet, rifle bar, driver and chuck are made especially durable by using nickel steels.

And think of the terrific beatings taken by rock drill frontheads and chuck bearings. These parts stand the gaff, because Ingersoll-Rand makes them from tough nickel steels that resist breakage.

Heart of the rock drill . . . valve chest and guide . . . is of nickel steel, too. Because in reversing some 4000 times per minute, the valve calls for seating faces that *stay true*. Otherwise efficiency falls.

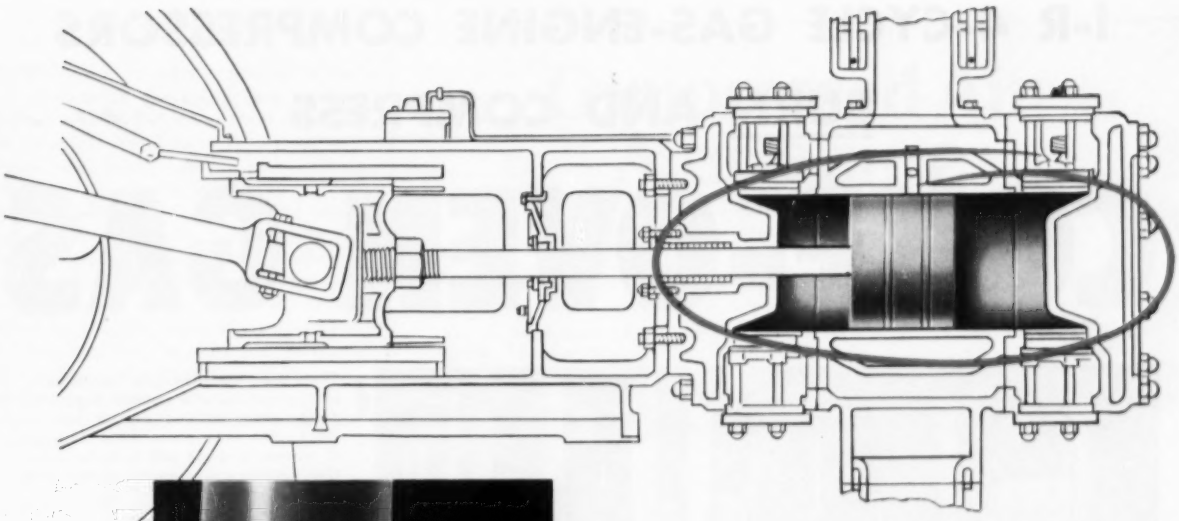
Under the most severe working conditions, you'll find that the desirable combination of strength, toughness and hardness of steels containing nickel can assure dependability of all such vital parts.

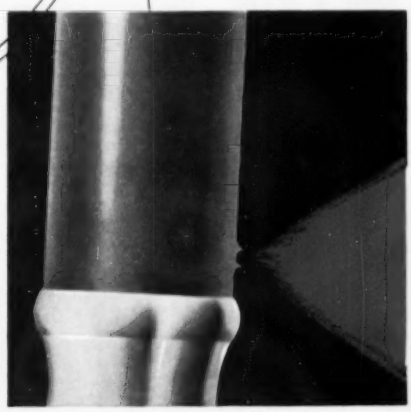
When you have a metal problem, make use of our wide practical experience. Let us show you how a nickel alloy may be the exact answer you are looking for. Send details of your difficulty for our suggestions. Take the first step now . . .

Write for List A of available publications. It includes a simple form that makes it easy for you to outline your problem.

INCO
TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.





prevention

at the points

where

fires start . . .

Fire-resistant Celanese* Cellulubes*

Synthetic lubricants and power transfer fluids are now available in 6 controlled viscosities

Celanese Cellulubes are fire-resistant synthetic oils, designed to provide protection against fire hazards and explosion inherent in many industrial operations.

As air cylinder lubricants in compressed air systems, Cellulubes prevent the formation of excessive carbon deposits—No. 1 source of compressor fires and explosions. They are excellent lubricants—highly stable, non-corrosive, non-foaming.

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With the expansion of the Cellulube series to 6 controlled viscosities: 90, 150, 220, 300, 550, and 1000 (S.U.S. @ 100° F.), the way is open to replace flammable fluids in many hazardous applications. If you would like to evaluate Cellulube in your own operation, use coupon below to order working samples and complete use data. Celanese Corporation of America, Chemical Division, Dept. 596-B, 180 Madison Avenue, New York 16, N. Y.

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Please send me working sample and technical bulletin on Cellulube for air compressor service____ for hydraulic systems____. Send technical representative____.

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Company_____

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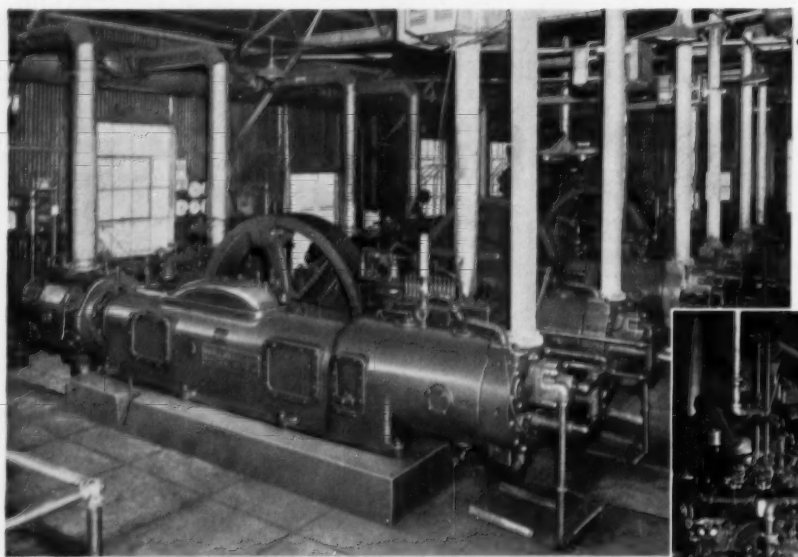
City_____ Zone____ State_____

Circle 15A on reply card

I-R 4-CYCLE GAS-ENGINE COMPRESSORS

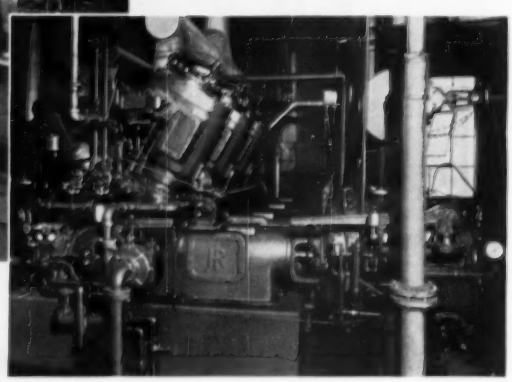
BURN AND COMPRESS

COKE-OVEN GAS



These four XG gas-engine compressors, of Ingersoll-Rand's earliest single-unit design, were installed around 1930 in the Ironton coke plant. After 25 years of service, they are still in daily operation, burning and compressing coke-oven gas.

This Ingersoll-Rand XVG gas-engine compressor (predecessor of the present SVG design) was installed in 1937, and is now carrying the primary coke-oven gas load at the Ironton plant.



. . . they've been doing it successfully

for 25 YEARS

at U.S. Steel's Columbia-Geneva Steel Division

The use of Ingersoll-Rand, 4-cycle gas engine compressors for handling coke oven gas, in both the power and compressor cylinders, dates back to one of the earliest installations of this type of equipment.

Here at the Ironton plant of U. S. Steel's Columbia-Geneva Steel Division in Utah, we have proof of the successful performance of I-R units in coke oven gas service over a period of about a quarter of a century. The units shown above are all still in daily operation, burning and compressing coke oven gas.

Ask your Ingersoll-Rand representative for the cost-saving advantages of I-R *4-cycle* gas-engine compressors in any type of coke-oven gas or natural gas service.

Ingersoll-Rand

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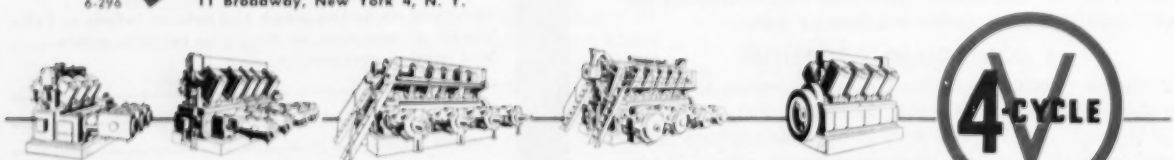

JVG 110-220 hp | SVG 330-660 hp | KVG 660-1320 hp | KVS 2000 hp Turbocharged | Plus a matched line of Power units

Circle 16A on reply card

ON THE COVER

THE most friendly creatures in Marineland of the Pacific are the porpoises. They put on a good show for the spectators and more than earn their keep, even though they have voracious appetites. Normally they jump for their food, as shown on page 40, but sometimes it is served to them underwater so that visitors looking through conveniently placed tank windows may view scenes like the one on our cover. In the bit of by-play pictured, Diver Bill Tinsley has fashioned the meal into the shape of a cake, surmounted it with a candle and taken it below on a tray. A jealous crab is heading toward him to try for leftovers.

IN THIS ISSUE

WHEN you tell the shoe salesman the size you wear, you save him and yourself a lot of time and trouble, thanks to the fact that shoe manufacturers plainly mark every pair they turn out. Marks of one sort or another—and they are of countless varieties—save us from utter confusion in our daily lives. Designing and producing machinery for marking just about anything is the business of Acromark, a New Jersey firm with an interesting background. Page 34.

•

PEOPLE are fascinated by the world beneath the waves, and aquariums are generally crowded in consequence. A new "oceanarium" of imposing size and architectural appointments is now open in California. Page 40.

•

INGERSOLL-RAND Company has literally given its highly adaptable air-operated Impactool a "new twist." By adding a torsion bar that can be preset to any desired tension it has paved the way for markedly increasing accuracy in tightening nuts and cap screws. Page 42.

•

ACCORDING to the American Petroleum Institute, a gallon of gasoline distributed over a distance of 15 miles would make a tiny stream about the thickness of a hair from a horse's tail. Yet the liquid in that thin thread could move a 3000-pound automobile 15 miles with the whole family in it. Oil companies spend millions annually finding new ways of increasing the power of gasoline and, as a result, it is now 50 percent more efficient than the gasoline of 30 years ago. Page 45.

Compressed Air Magazine

VOLUME 61 **February, 1956** NUMBER 2

G. W. MORRISON, *Publisher* C. H. VIVIAN, *Editor*
ANNA M. HOFFMANN, *Associate Editor* J. W. YOUNG, *Advertising Director*
R. J. NEMMERS, *Assistant Editor* FRANCIS HARTMAN, *Circulation Mgr.*
J. J. KATARBA, *Business Mgr.* R. W. SAPORA, *Foreign Circulation Mgr.*
D. Y. MARSHALL, Europe, 243 Upper Thames St., London, E. C. 4.
F. A. McLEAN, Canada, New Birks Building, Montreal, Quebec.

EDITORIAL CONTENTS

ADVERTISING CONTENTS

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"If you Want to Market It,
You've Got to Mark It,"
Says H. O. Bates

Meaningful Marks

C. H. VIVIAN

MOST things we use bear identifying marks of some kind to indicate size, number, grade, model, brand, trademark, name of manufacturer, etc. Without these marks buying anything would be a nightmarish experience and a monumental gamble. Imagine, for instance, trying to come by such an ordinary article as a man's white shirt of suitable quality and fit in a store where neither the garments nor the boxes containing them are labeled. Having finally bought the shirt, suppose you sent it to a laundry that has no system whereby it can be distinguished from the hundreds of others processed the same day. Now, getting a little more complicated, picture the supreme surprise and confusion that might await shoppers (and diners) if canned goods on supermarket shelves were unmarked, or the dire consequence of unlabeled medicine bottles. (Such problems confronted some people in the northeastern states after Hurricane Diane paid her visit last August.)

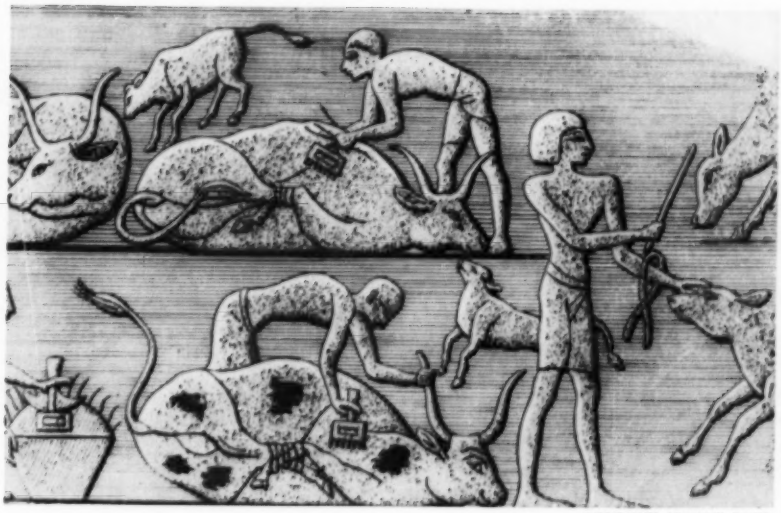
Think how useless and meaningless advertising would be if you couldn't request goods by brand names. Suppose each time you shopped you had to find out all the things about a product that you now take for granted when you see a certain label or trademark. If you are a merchant or an industrial storekeeper, visualize the difficulties of taking inventory if the items in stock bore no means of identification. Consider how long it would take to turn out an automobile, washing machine or TV set if the components and the tools for assembling them were devoid of distinguishing marks. Also, picture your plight if you were trying to order spare parts for a machine or appliance and found that they weren't numbered or otherwise identified. Enough has been said to make it obvious that orderly life and industry depend heavily on markings. They are with us throughout the entire span of existence from nursing bottles to caskets.

A few forms of functional markings such as those on coins go back a long way, but most of them were merely decorative until a few centuries ago. In this class were the etchings on armor. One of the first markings having the significance we now attach to them was the hallmark that was stamped on gold and silver articles made by the Goldsmiths' Company, in London. Introduced as early as 1363, it recorded the date of manufacture, the maker's name and attested to the purity of the metal. A survival of this custom is the current practise of placing the carat rating on gold jewelry and the word "sterling" on silver of 92½ percent purity.

Markings are now applied to just about every kind of durable goods in every conceivable fashion, the method used depending on the nature of the product and the purpose of the symbols. They may be cut, stamped or stained, engraved, embossed or etched, painted, printed or burned. Where feasible, they are normally put on the article con-

SAMPLES OF WORK

At the left are a few of the many small articles that are marked with Acromark machines. The materials include plastic, wood and various metals, and the pieces are of many different shapes. Above are specimens of metal Social Security cards that were widely used when that government program was new. They were created by H.O. Bates to promote the sale of his Acromarker name-plate stamping machine (picture on next page). A competent girl operator could stamp the names and numbers on as many as 300 cards in an 8-hour day.



BETTMANN ARCHIVE PRINT

CATTLE BRANDING IN ANCIENT EGYPT

This mural from one of the tombs at Thebes shows that branding livestock to assert ownership goes back many centuries. Note the bellows at the lower left presumably used to fan the fire in which the irons were heated.

cerned, but paper and metal tags are also used extensively and many machines bear plates on which anything from patent and serial numbers to operating instructions may appear.

Small boys cut their initials in personal belongings to assert ownership. Cattlemen sear the hides of their range animals with hot irons for the same reason. Similarly, baseball bats and other products of wood are commonly trademarked with heated dies. Some modern instruments leave behind them symbols that are invisible in ordinary light. For example, the back of one hand of turf-racing fans, who pay an extra fee to sit in the clubhouse, are stamped when they leave the enclosure temporarily. The dye doesn't show up until the person, upon his return, places the hand under an ultraviolet lamp. Then there are fluorescent inks that can be seen only under black light. For objects made of wood there are marking nails with numbers or other characters on their heads, and hammers are available with dies on their striking faces for marking logs and lumber. Railroad ties are often dated by such tools when they are placed in service. In other cases nails driven into wood products are arranged to form numerals or symbols.

Documents ranging from state papers to simple notarized forms are impressed with an embossed seal that betokens their authenticity. Our automobile license plates certify that we have paid the stipulated fee. Coins, bus or streetcar tokens, employe badges, charge-account plates at stores—all closely associated with our daily lives—are simply vehicles for markings. Sometimes the latter are essential to the proper functioning of the things on which they appear and must be applied with the utmost accuracy. In this category are rulers, micrometers, gauges and the like (even the housewife's measuring cup).

Some markings are designed partly for public protection, an example being those on radio tubes and other articles that are frequently counterfeited and offered for sale by unauthorized dealers. Others are for the manufacturer's protection: that little white dot on the stem of a certain aristocratic smoking pipe guaranteed against defects for a year isn't just an ornament. To those in the know it tells how old the pipe is, and it will testify for or against you if you present a damaged pipe and ask that it be replaced with a sound one.

Among the literally hundreds of concerns that make marking devices of one sort or another is the Acromark Company, of Elizabeth, N. J. It is owned and directed by Harold O. Bates, who obtained his early experience in the field by working for other firms. Acromark makes no rubber stamps or similar elementary tools. All of its machines involve engineering. Some are operated by hand, others by power. Many are stationed in factory production lines where marking is one step in a series of operations. For such applications compressed air is commonly used to feed and position the pieces, to apply the marking or power stroke and to eject the work. When the equipment is of the punch-press type, suction cups sometimes serve to pick up name plates after they have been stamped, to transfer them to a magazine and arrange them in the order of their serial numbers. Vacuum may also be applied to the undersides of plates to hold them during the process.

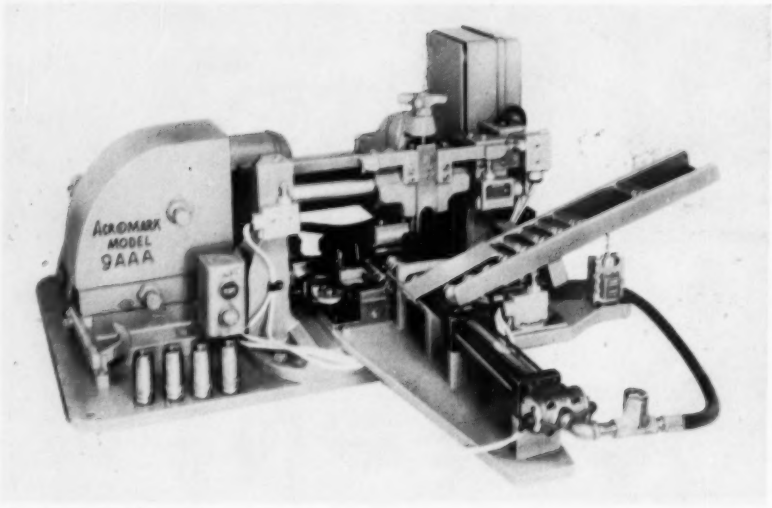
THE ACROMARKER

This simple machine, designed primarily for stamping name plates, is one of the most widely used of the Acromark line. The part to be marked is placed on the table, and the dial is rotated to bring each die, in turn, into operating position. A swing of the handle, left, exerts powerful screw pressure that raises the table and work against the die. Turning a second handle (right) moves the work to provide proper spacing between characters. The die wheel carries a complete set of replaceable numbers and letters, and special symbols may be substituted if desired. There are different models suitable for stamping precurved plates or extra-large ones, or for deep stamping. A foot-controlled unit leaves both of the operator's hands free. Materials marked include fiber, plastic, tin, zinc, bronze, cold-rolled steel and stainless steel.

"It has reached the point," says Bates, "where you almost require air to mark economically." The machines are built to use air at the usual commercial pressure of 75-100 psi so they can be readily tied into established distribution lines.

Typical of many Acromark products is a unit developed for the Hoover Company, pioneer manufacturer of vacuum cleaners. In it, plates are stacked up like in an addressing machine. It makes a name plate for each motor and also a duplicate paper record that accompanies it through the shop. As the two move along the paper acquires marks to show who worked on that particular motor. Should the latter develop trouble after it goes into service its genealogy can be traced and the responsibility for the defect placed.

Another example, this one in the television industry, will illustrate the vital role identifying marks play in industry. One of the final operations in assembling the various components of a kinescope (color TV) tube is that of adding the plastic base. The tube is sealed at that time and a serial number is assigned to it. During the remainder of the manufacturing processes, and on through testing, inspection, packaging and labeling, it is important to keep a complete and positive record of each tube. The serial number on the base serves to identify the tube throughout its life, and there have been cases where it was actually involved even after a tube's usefulness had ended.

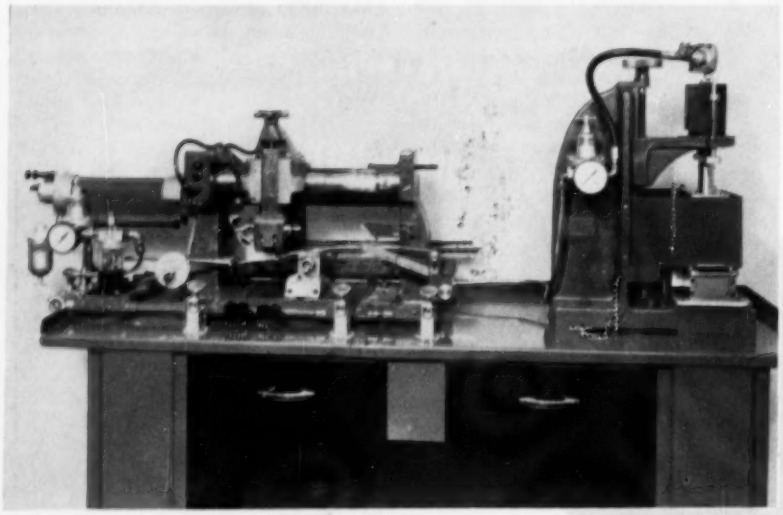


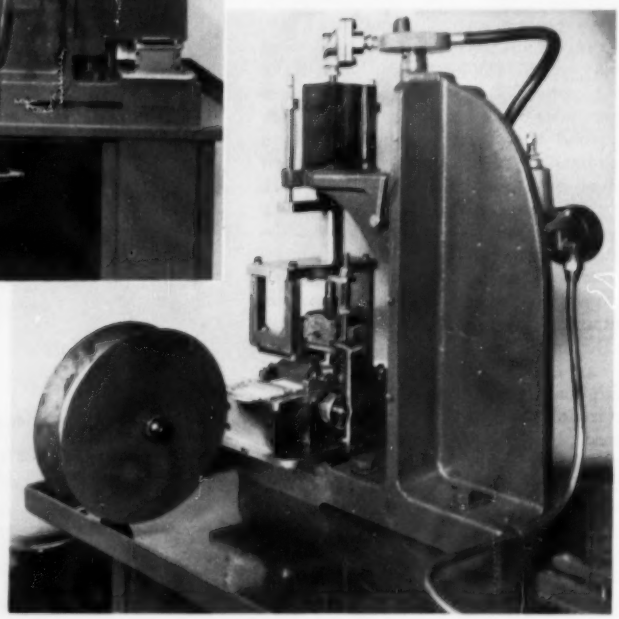
AIR-FED PRESS

This machine was developed for marking .30-caliber rifle shells, some of which are shown in the left foregound. As a shell reaches the bottom of the inclined gravity feeder at the right it is moved into position by an air-operated ram. A blast of air ejects the work after it has been marked.

The serial number must be put on both the tube and its container in such a way that it cannot be erased or changed. As it would involve extra work to copy it, with the ever-present chance of error, it is desirable to provide means of placing the numeral on the outside of the package when the tube finally reaches the stock shelf. That has been accomplished by a new Acromark machine, which is illustrated. Really a combination of two devices, it is air operated and has air and electronic controls.

The machine indents and color-marks the company name and the tube's serial number on the base before the parts are



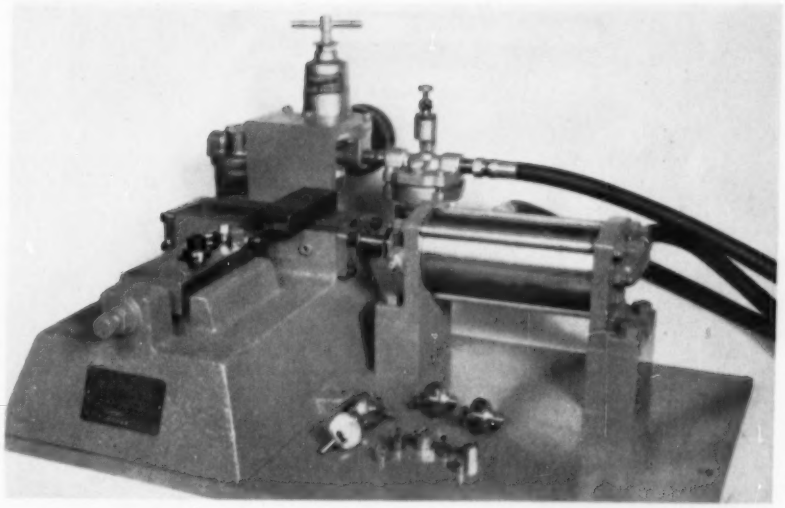


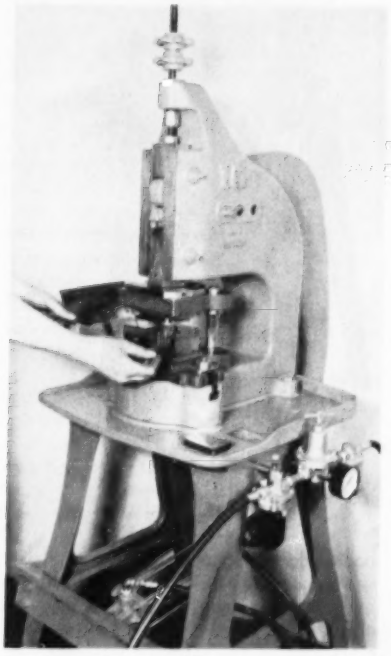
VACUUM-TUBE MARKER

The left section of the unit (above) marks and numbers plastic bases of color-television tubes with colored indentations and that at the right prints the same serial number on an adhesive-backed label that is affixed to the tube and accompanies it through subsequent processing. A base, two of which are shown in front of the left part of the machine, is placed on a mandrel by hand and the operator starts the marking mechanism, which is air-powered. Three controls are seen in the foregound, and as two of them must be depressed before the unit will function both of the worker's hands are kept busy and away from possible injury. The label-printing section has a reel at the back (shown at the right) from which the adhesive-backed tape is fed. An air ram lowers a numbering machine to print the serial number through an inking ribbon.

CONVERTED TO AIR POWER

The machine below, originally operated by foot pressure, was converted to air drive by mounting a cylinder in the base. It is shown set up for embossing and cutting small stainless-steel name plates at one time. The other unit was changed over from hand operation by attaching the pneumatic cylinder on the right side. The press rolls imprints on cylindrical parts; in this case it was putting numbers on the cable clips shown in the foreground.





joined. The same numeral also goes on an adhesive-back ticket, which is affixed to the tube itself at the time of assembly. This label remains in position until all subsequent operations have been completed and the product is ready for packaging. Then it is removed and stuck on the end of the container to identify its contents as it passes on through the channels of trade. This system of marking eliminates the need of preprinted serialized tickets and the likelihood and opportunity of shifting such tickets from one tube to another.

The serial number records the tube's age for the maker and the distributor. This often averts lodging unjust claims, and may save the manufacturer from having to replace a tube after its period of warranty has expired. This precaution is of considerable value to him because vacuum tubes have many delicate parts and contain materials that are subject to corrosion in certain atmospheres and under varied temperatures and can, over a period of time, completely change in efficiency characteristics.

The machine is mounted on a steel table with two drawers that may contain interchangeable type, dies, color transfer tape and other needed materials. One operator handles the equipment and can mark 60 or more bases and corresponding labels per minute, provided the work is brought to him.

The original metal Social Security card was a Bates creation to promote the sale of his Acromarker name-plate stamping machine. He also designed and built a typographic numbering machine for Bates Manufacturing Company (no relation) and sold it to that concern with all rights.

There is nothing that can't be marked in some way, Bates contends. One day some years ago when he was talking in that vein, a fellow New Jerseyan, who was interested in mosquito control, asked him how he would go about marking a mosquito. Even that didn't stump him. He suggested color-coding the insects by spraying dyes on swamps that were suspected of being breeding places. The system was adopted and worked. Mosquitoes killed on beaches could thus be traced to their points of origin and suitable steps taken to eradicate the breeding grounds.

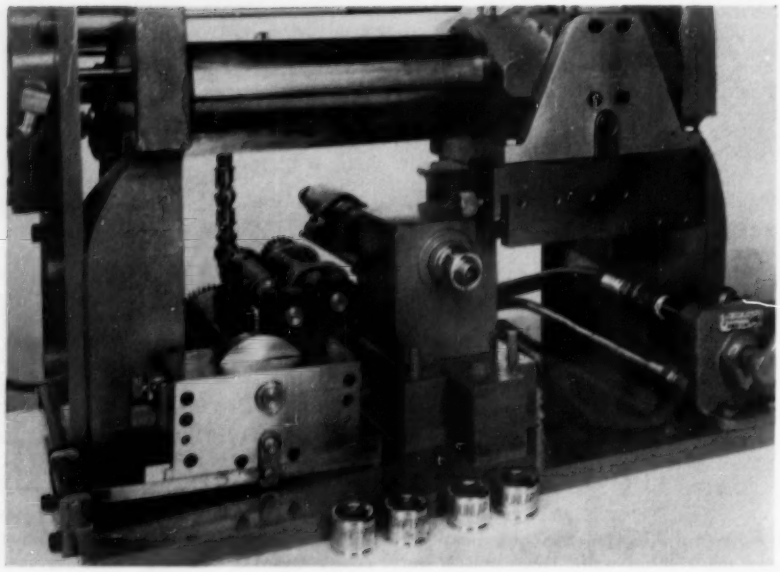
As a specialist in industrial marking devices, Acromark makes equipment for marking just about every material from paper, fabrics, plastics and wood to hard steel. Nothing is too small or too large to be dealt with. Such tiny items as phonograph needles, safety pins, eyelets and rivets are marked, just as are heavy parts for locomotives, power shovels and the like. In the case of the latter, most people assume that big marking machines are required, but that is not true. Bates elucidates this point with the remark that you don't need equipment the size of an elephant to mark an elephant. The heaviest machine Acromark ever developed weighed about a ton and was used for 75- and 125-mm shells during World War II. One of the hardest products to mark is a rerolled railroad rail, Bates reveals; the pounding of heavy trains apparently work-hardens the steel.

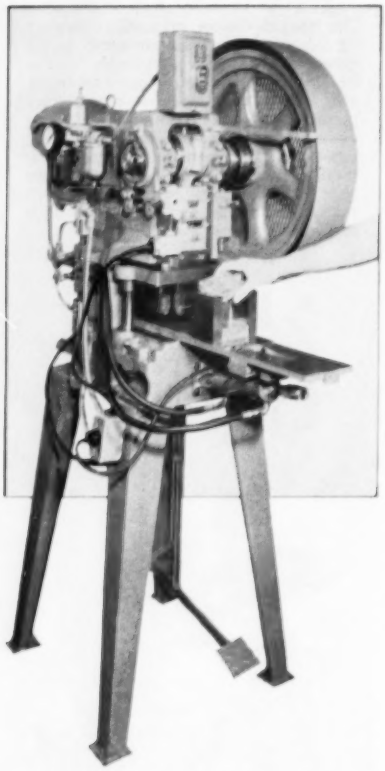
Only the parts that are under stress have to be heavy. Generally, heavy-duty machines are designed to do the marking with a rotary movement of the die. If you try to make an impression by bringing the entire die in contact with a solid metal surface you have to exert tremendous pressure. But if you impart a rolling motion to a die in which the characters occupy a curved section they will contact the surface one at a time and the job can be done with less expenditure of power. Bates originated a chart that shows how much pressure is needed to stamp ⅛-inch-high characters in a piece of steel hardened to 40 on the Rockwell scale. Such information is not found in textbooks. Incidentally, characters around the ⅛-inch size—big enough to be read easily—are most commonly used.

Bates established the Acromark firm during the big depression period. After studying engineering at Allegheny College in Meadville, Pa., and serving in World War I, he went to work in the early 1920's as a salesman for one of the larger makers of marking devices. He traveled out of Pittsburgh, seeking possible customers mainly in Ohio and West Virginia. Most manufacturers in the area were then shipping their products in wooden boxes. Paperboard was a relatively new material, and carton companies were trying to get the pack-

"The purchasing power for consumer goods is most often swayed, if not completely controlled, by marking and stamping. Products are minutely scanned for the maker's symbol or trademark for assurance of quality or dependability by prospective buyers. Without it, sales are often lost because of reluctance on the part of consumers to purchase goods of unknown origin."

—FROM AN ACROMARK CATALOGUE





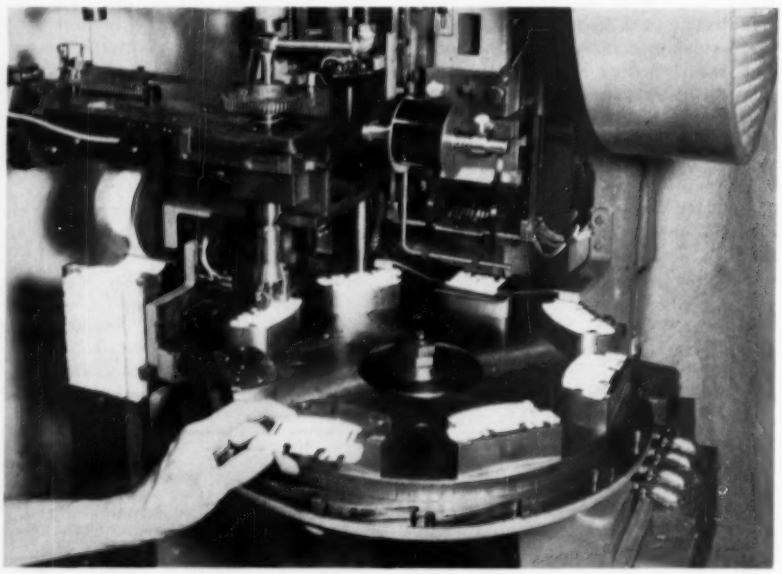
MULTIPLE AIR SERVICES

On the machine at the right an air feed automatically transports metal name plates into a stamping section where they receive a serial number and are automatically ejected into a magazine in sequential order. In the view above is shown a metal hose ferrule (center) being held by a pneumatically operated internal expanding arbor. A trade name has just been stamped into it and filled with ink enamel. Air power also operates the inking system and clamps and unclamps the work fixture. In the case of some products, marked pieces are ejected by air.

aging business. Bates began to work with them. Supposing a carton salesman was negotiating with a cigarette factory. Bates, who has some artistic skill and a flair for designing, would make a sketch incorporating trademark, lettering, etc., to show how the finished package would look, and if the carton concern made the sale Bates would receive the order for the printing plates.

In his territory were numerous glass manufacturers that were stenciling their shipping containers. He showed them how they could do the job better and faster by newer means and got orders for the necessary equipment. Those early experiences taught him something about selling that he still emphasizes: "If you make what people want they will buy it." To find out what they want or need, he contends, you must go to see them and study their problems firsthand.

He moved to New York to attend New York University's School of Commerce, and while there established a branch office for his firm. He remained with it until he was asked to manage a branch plant in Chicago. That didn't appeal to him at the time, so he quit and went to Hollywood for a fling at the movie business. He also sold Franklin (air-cooled) automobiles to film stars for a while and then got the idea that short comedies would fit into the programs of city cinemas which were then filling in the gaps between feature films with "live" vaudeville acts. He obtained some financial backing, put a ranking comedian of the day under contract and set about laying the groundwork preparatory to production. When he needed money to keep things moving he reported to his backer, who happened to be a widow. She informed him that since she had last talked with him she had fallen in love with a young man and was going to use her money to start him in the laundry business.



ROTARY STAMPING PRESS

This Acromark hot-stamping press with an indexing table marks serial numbers on white-enameled face plates for electric motors. After being stamped, each part is picked up by pneumatic fingers and transferred to the magazine at the left. Another air-actuated unit places a strip of paper across the plate to protect it from scratches and other damage.

That ended the Hollywood whirl, and Bates returned East and to his former employer. He built up his old connections, opened a factory for the firm in Newark, N. J., and helped open others. Later he became associated with another firm in the same field on a profit-sharing basis. But the agreement was verbal, and when it was not honored at the end of the year Bates left and started his own concern.

In those first years of getting established he was salesman, designer and manufacturer, all rolled into one. He made lots of calls, always for the purpose of finding out what people were trying to mark. If there was no machine available that could do the job, he designed and built one. That has gone on until Acromark now has about 400 basic units. Today, when new applications arise it is usually possible to make a few changes in an existing model and adapt it to meet requirements.

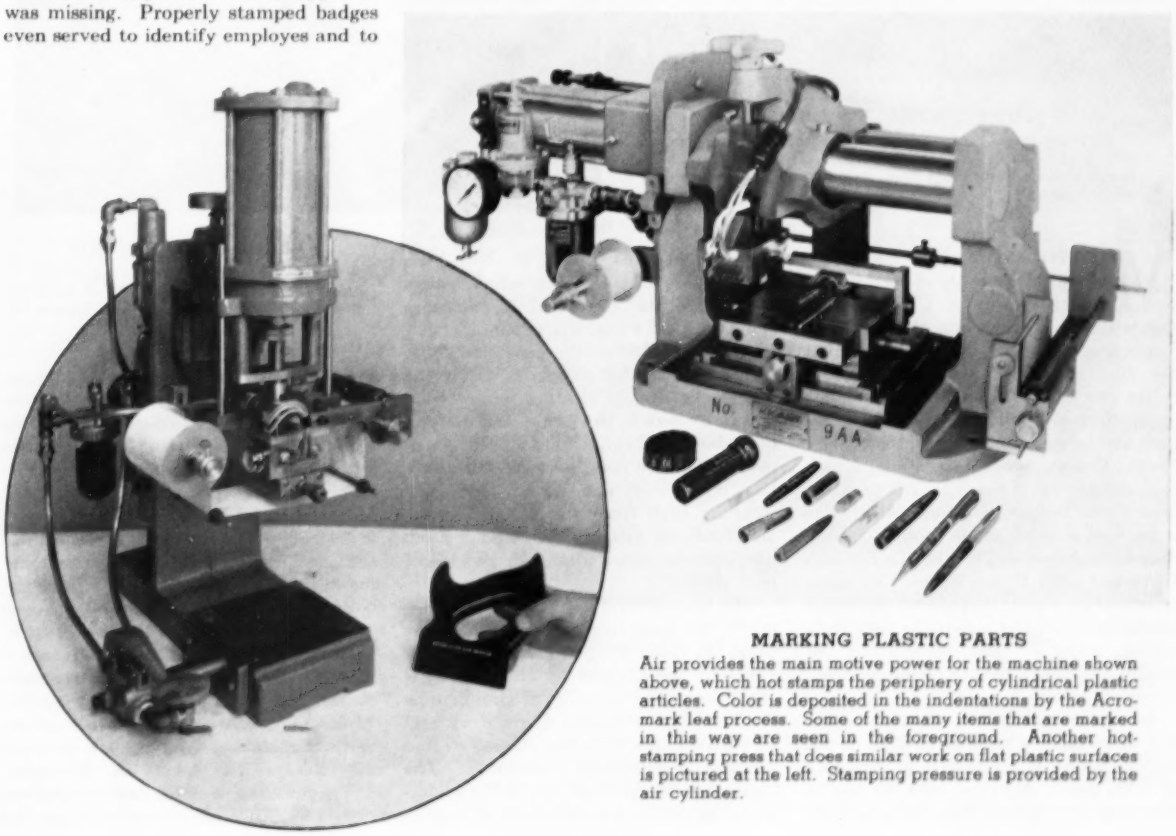
Bates gives the era of mass production and interchangeable parts credit for the great increase in the demand for marking. If you want to replace a part, you've got to be able to identify it. During World War II marking materially accelerated the manufacture of essential goods. It facilitated easy identification of components and thus made for more efficient assembly operations. Duds were plucked from shell shipments because an inspector's visible approval was missing. Properly stamped badges even served to identify employes and to safeguard premises against intruders.

More recently, the rise of plastics has further influenced the marking-equipment industry. The field of hot-stamping and printing plastic products is a big and growing one. Different materials require different machines and techniques. The hard and brittle thermosets that are molded from powder call for high heat and little pressure. Generally, a pigment is used and transferred by the heat. Some of the softer types can be marked without recourse to heating; but there are many kinds, and the treatment needed is so diversified that Acromark has developed its own inks, pigments and transfer tapes to meet the various conditions. The firm now sells these materials, plus the machines that apply them.

During World War II, Acromark made a 7-inch aluminum dial gauge for the famed Norden bombsight. This was bonderized, and markings were engraved through the coating for better visibility. An error of one-tenth of a degree (1/3600th of a circle) would throw a bomb from 25 feet to 25 yards off the target, depending on the altitude of the plane. Bates designed equipment to mark the dials with great accuracy, and up to the last year of the war is believed to have produced all the dials used except those made in the Norden factory.

The name Acromark has a special significance—it means "accurate marking." It was coined by Bates in 1937 when the prefix "micro" was much in use. Seeking something similar but not identical, he rolled various words around on his tongue and came up with Acromark. Incidentally, Bates had to have some knowledge of advertising in order to sell his equipment and was so interested in the business that he decided to invest in it. Having completed a night course in the subject at New York University a few years previously, he opened an advertising agency in Elizabeth in 1950. Called Advent Associates, it handles about 25 industrial accounts, including that of Acromark. Bates and his family own both companies outright. To help him run them he has some key lieutenants, many of whom have been with him for ten years and more and have become specialists in their fields.

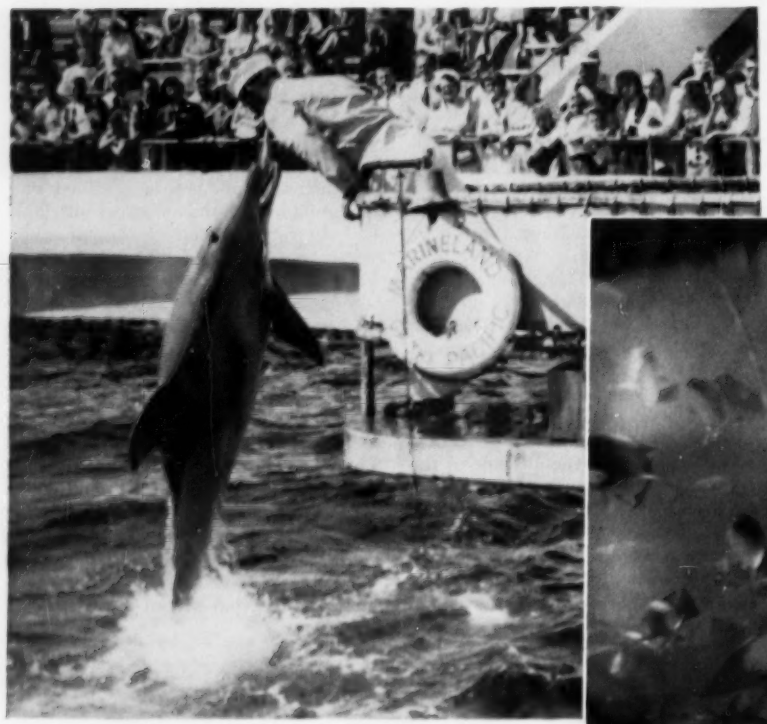
Because most of the components for the marking machines are purchased from outside suppliers, the plant is engaged essentially in assembling them. Consequently it has a small working force for its large volume of production. The men, however, are highly skilled in the precision work that is required to turn out products that are themselves designed to do their work with great accuracy. Compressed air is used in some of the manufacturing steps and for testing machines that are air-operated.



MARKING PLASTIC PARTS

Air provides the main motive power for the machine shown above, which hot stamps the periphery of cylindrical plastic articles. Color is deposited in the indentations by the Acromark leaf process. Some of the many items that are marked in this way are seen in the foreground. Another hot-stamping press that does similar work on flat plastic surfaces is pictured at the left. Stamping pressure is provided by the air cylinder.

Marineland of the Pacific



JUMPING FOR HIS DINNER

A porpoise leaps high to take a fish from the grasp of an attendant's teeth. These piscatorial clowns toss and retrieve rubber playthings and perform various other stunts on command.

MARINE ROOM SERVICE

A diver with a box of ground squid and other tasty tidbits gets plenty of attention as he walks along a tank bottom.

MARINELAND of the Pacific, an aquarium recently opened in Los Angeles County, California, is reputedly the world's largest facility for displaying and studying marine animal life. Built at a cost exceeding $3,000,000, it has two big tanks and several smaller ones, which are well populated with common and rare specimens from the nearby Pacific Ocean. The 65-acre site, which includes adequate space for car parking, is on Palos Verdes Peninsula, which was a part of a land grant made to Juan Jose Dominguez in 1784 by the Spanish Governor Don Pedro Fages. In early times, when whales frequented the area's sheltered coves and lagoons to bear their young, many of them were killed annually and taken ashore to reduce their carcasses to oil.

In the two main tanks of the aquarium are more than a million gallons of sea water, which is circulated at the rate of 7000 gpm. A round tank 80 feet in diameter and 22 feet deep holds 640,000 gallons. No effort is made to control the temperature of the water, which varies with that of the ocean, and the enclosure contains species that live offshore in that vicinity throughout the year. A 1500-seat amphitheater overlooks it, giving spectators a fine vantage point from which to watch the tame and playful porpoises perform. These natural comedians of the deep perform many antics, but always get top acclaim when jumping high from the water to take fish from an attendant's hand. Each porpoise consumes about 25 pounds of food daily.

The second large tank, of oval shape, is 100 feet long, 50 feet wide and 22 feet deep. It holds 550,000 gallons of water which is maintained at close to 70°F the year round to make it comfortable for fish that normally migrate up and down the coast with the seasons to find uniform temperature conditions. The occupants of this tank are all fed underwater by divers who go down at regular intervals with baskets of chopped squid, which is favorite fare with all of them. Air for breathing is furnished the divers by hose lines connecting their helmets with a distribution piping system. To eliminate oil vapors from the air, the Ingersoll-Rand compressors that supply it are equipped with carbon piston rings that perform their function without being lubricated.

Streams of water under pressure are jetted into some of the tanks and carry with them bubbles of air that insure a plentiful supply of oxygen for the denizens. The water is handled by an I-R Motorpump. A similar unit serves the water circulation system that continually changes the supply in the tanks.

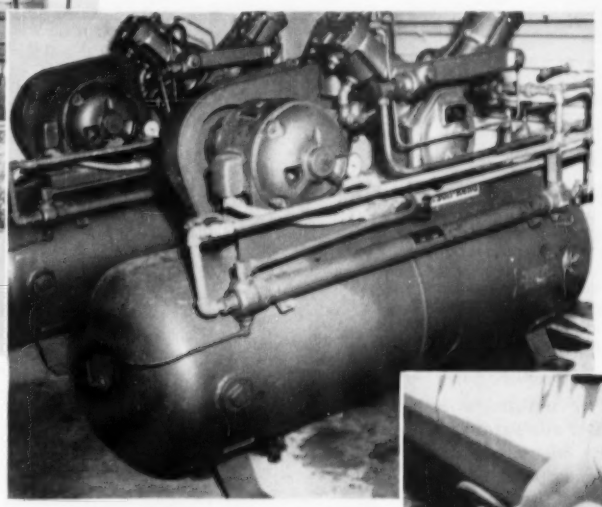
To curb the cannibalistic tendencies of the fish to some extent they are fed

MAIN ENTRANCE

The larger tanks rise high in the air and there are walkways at various levels from which visitors can watch or photograph the finny denizens through windows or portholes.

GOING DOWN

A diver in full underwater dress (lower picture) starts down a ladder into one of the big tanks. His air supply reaches him through a hose line connected to the piping assembly in the foreground which includes filters to remove moisture that condenses in the long pipes extending from the compressors. The latter, shown in the upper picture, are fitted with non-lubricated carbon piston rings to make certain that no oil vapor gets into the air.



six times during the day and once at night. Even so the small species suffer some decimation from the larger predators, and replenishing of the stock goes on continually. For this purpose Marineland has its own specially equipped vessel, The *Geronimo*, which roves the ocean dipping its nets in different areas. Every time they come up they are eagerly inspected in the hope that they may contain some rare specimens. A 250-foot pier has been built to permit the ship to dock close to the aquarium. Some unusual methods are used in transferring the quarry to land. For example, porpoises ride on rubber mattresses suspended from a crane by rope slings. To prevent their sensitive skin from drying out they are covered with a wet blanket while en route.

New species are kept for a time in a 40-foot quarantine tank, where any infection that develops can be detected and treated so as to avoid possible contamination of their companions when they reach the permanent tanks. A well-equipped laboratory is maintained for the purpose of studying diseases of fish — finding ways to lengthen their lives.

Windows or portholes at three levels permit watching and photographing the inhabitants of the main tanks. In all, there are 358 of these observation posts. Aside from the big tanks, smaller ones are provided for the display of certain species of marine life. In a 15-foot tropical tank swim hundreds of multicolored fishes of many sizes and shapes, and to reproduce their natural habitat as closely as possible it contains a large coral reef that has been constructed of many little pieces. Then there are aquariums of moderate size better to show and protect specimens from near and far, including sea horses from Florida. Seals live and disport themselves in their own area alongside the main entrance, and octopi have a special home which is supplied with 48° water the year round.

Marine life has always fascinated people, and the custom of keeping fish in captivity goes back hundreds of years. The ancient Romans built and stocked huge reservoirs, and the early Chinese are said to have made a hobby of keeping small ornamental fish in tanks. The first modern public aquarium of note was opened in 1853 in Regent's Park, London, and many countries now have places where aquatic creatures are exhibited.

For many years the New York Aquarium at the tip of Manhattan Island was one of the showplaces for tourists. A circular building that was once a fort, it was razed a few years ago when Battery Park was torn up in connection with the opening of the vehicular tunnel to Brooklyn that starts there. The first stage of the new facility is being constructed at Coney Island at a cost of $1,000,000 and scheduled to be ready for occupancy this year. The John G. Shedd Aquarium in Chicago displays approximately 10,000 varieties from the rivers and oceans of every continent.

Known to every visitor to Florida are the Marine Studios at Marineland, near St. Augustine, after which the installation on the Pacific Coast is patterned. The Florida aquarium was built in 1937 to serve as an underwater motion-picture studio and to afford scientists favorable opportunities for observing and studying marine life under somewhat natural conditions. It was later opened to the public. Its two main tanks are somewhat smaller than those in California. They are 12 and 18 feet deep and hold 380,000 and 420,000 gallons of water, respectively.

Marineland of the Pacific is owned and operated by Oceanarium, Inc., and was designed by Pereira & Luckman, of Los Angeles. It is independent of Marine Studios, but the two have an agreement to exchange scientific and technical information. To insure a continuing mutual interest, the president of the Florida organization has become a director of Oceanarium, Inc.

THE NEW LOOK

The torsion bar, which is shown with the sleeve designed for adjusting the torque rating, adds a little to the length of the Impactool but otherwise does not change its appearance. Torsion bars for torque settings of either 60 or 90-foot-pounds are available for this small size tool.

TAKING THE GUESSWORK OUT OF NUT RUNNING

THE answer to industry's long quest for a better and surer way of tightening nuts adequately seems to be at hand. By incorporating a torsion bar in an Impactool, Ingersoll-Rand Company has developed a machine that delivers the desired torque for the tightening job and then shuts itself off. Thus far the improvement has been embodied in two sizes of Impactools—one a heavy model suitable for use in assembling the steel framework of buildings and the other a smaller tool that can be employed to advantage on many factory assembly lines. More sizes will be brought out as rapidly as possible.

The use of nuts and cap screws in various branches of industry has been increasing fast in recent years, a situation that has aggravated the problem of determining when the desired tightness has been reached. Heretofore the degree of tightness obtained has depended largely on the individual skill of the operators of the different portable power tools that have become available for nut running. Everybody concerned, however, has been trying to find a way by which the torque or twisting effort of the spindle could be controlled more positively. For practical purposes a variation of from 10 to 15 percent from a given mean value is considered acceptable, and tests indicate that this goal can be reached with the new Torque Control Impactools, as they are designated.

All earlier nut-running tools in general use have shortcomings that make it difficult to tighten nuts uniformly. The hand speed wrench depends on operator strength and judgment and is too slow for serious consideration in many applications. Air-driven tools of the type that have the motor geared directly to the nut-turning socket will stall the spindle when a nut has been run up tight. By adjusting the air pressure the stall torque can, theoretically, be controlled proportionately. But this tool has two disadvantages. First, the run-down speed decreases as the air pressure is reduced so that the effort to control the torque closely also slows down nut running. Secondly, the operator must take as much torque reaction through the handle of the tool as is applied to the nut. This is especially tiring in the many cases where he must assume an unnatural position to do his work.

A third type of tool that may be powered either by air or electricity has a clutch that slips when sufficient resistance develops. Theoretically it keeps up its regular speed until slipping starts and, consequently, has an apparent advantage over the direct-connected tool just mentioned. However, some dissatisfaction has been voiced about the slipping clutch dissipating considerable energy in the form of heat. Lubrication is critical, and this factor, plus the heat, leads to variations in performance in the course of a day. On production jobs it is necessary, if proper accuracy is to be maintained, to lubricate, check and adjust the clutch as many as five or six times during a shift. Also, clutch-type tools are generally heavier than those of the stall type.

The most popular nut-running tool today is the modern impact wrench. It accumulates energy and dissipates it rapidly in a series of rotary hammer blows. Because of the energy-accumulation feature it can produce a nut-running torque that may be up to ten times stronger that that developed in one of the previously mentioned tools of equal power. Furthermore it has about double their run-down speed. Because the energy is exerted in hammer blows the operator feels no torque reaction and can use such a tool with complete safety.

ON HEAVY WORK

Shown here in action is the larger of the two sizes in which the new tool is now available. The man above is using one on a freight-car underframe to tighten a roller-bearing axle assembly to 320 foot-pounds torque. At the right a unit of the same type is bolting up structural steel to 470 foot-pounds torque. In both cases the nuts are of ⅞-inch size. This tool, the 5340T, weighs 31½ pounds, is slightly more than 24 inches long, has an average working speed of 635 rpm and impacts on an average 1270 times per minute.

An objection to Impactools on nut-running work has been the meager torque control they provide. Torque builds up rapidly, and the amount applied depends entirely on the operator's judgment as to when a nut is tight. However, because the tool is light and its action fast, industry has learned to use it despite this limitation. With it, trained workers can obtain acceptable results most of the time, but that is hard to do when it becomes necessary to replace an experienced operator with a novice.

A top-notch quality-control man in the automotive industry has been quoted as saying that, in working with low torques in the 30-foot-pound range, he would expect a variation of 12 foot-pounds, or 40 percent, with the stall type of tool used with a pressure regulator; of 25 foot-pounds, or almost 85 percent, with a clutch-type electric tool; and of 40 foot-pounds, or 130 percent, with an Impactool.

The difficulties of training operators and keeping skilled ones on the job are largely responsible for the marked variation in performance, and it is therefore plain why any tool that minimizes the human element has the greatest chance of solving the problem. Because of the Impactool's popularity and inherent advantages, it is also easy to see why it was logical to apply the new development to that machine.

Engineers liken the action of the Torque Control Impactool to that of a child's pogo stick, which rebounds higher from a concrete walk than from soft ground. The tool operates at normal power and speed until the resistance of the nut is equal to the stress present in the torsion bar. The hammer then rebounds farther than usual and trips a rubber-faced valve that shuts off the air supply.

Tension is applied to the torsion bar by twisting it and locked in it by means of a sleeve at its outer end. A jig is furnished for use in setting the larger tool but is not required for the small one. The former is shipped with a torque setting of 320 foot-pounds, but this can be increased to 550 foot-pounds.

The bigger tool, designated as the 5340T, was designed for service in the new field of fabricating structural steel with high-strength bolts. It is reported that this method is now used on nearly one-fourth of the new buildings being erected, and it is predicted that the proportion will double within a year. The machine runs nuts on ¾-inch and ⅞-inch bolts, which are the sizes specified in the building codes of many large cities.

Steel erectors have been relying mainly on human judgment to obtain the desired tightening effect. Both the bolting-up tools and operators are checked each morning by running a series of nuts in a special recording machine that registers the stress on a gauge in the form of hydraulic pressure. By means of these tests it is possible to determine when the tools are capable of exerting the required torque and also how long they must be run to reach that torque. The operators are then expected to go up on the steel and run the tools for the same length of time to obtain proper and equal tension in the bolts. Actual working conditions vary considerably—often differ greatly from those under which the morning tests are conducted.

The new tool gives promise of speeding up steelwork assembly and of reducing its cost. Compared with riveting, it requires a team of only two men instead of four, and the workers need not undergo a period of training to become highly efficient. Compared with current bolting methods, it eliminates testing for tension, improves quality and saves considerable time.

The smaller of the two models, called the 5040T, will handle nuts up to ⅝ inch and is rated for torques up to 90 foot-pounds. It is a size much used in assembling automobiles, electrical appliances and light and heavy machinery and for maintenance work in steel mills, oil refineries and chemical plants.

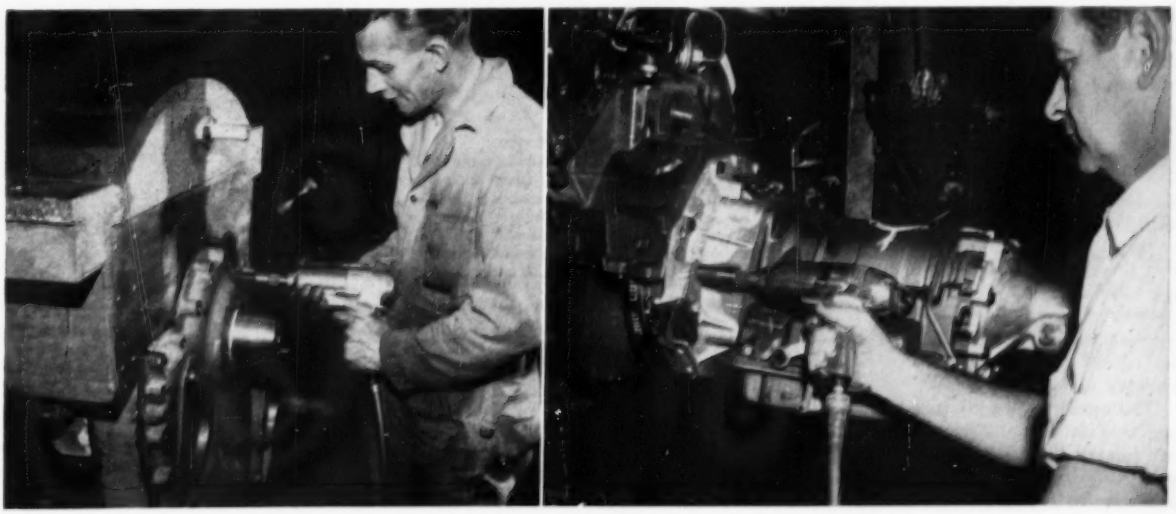
The automatic shutoff feature of the new tools eliminates "overtorquing." This minimizes wear and tear which, together with the absence of a clutch, reduces upkeep costs. Pressure regulators are unnecessary because the tools operate at full power. For the same reason, operators are not afraid to open them up.

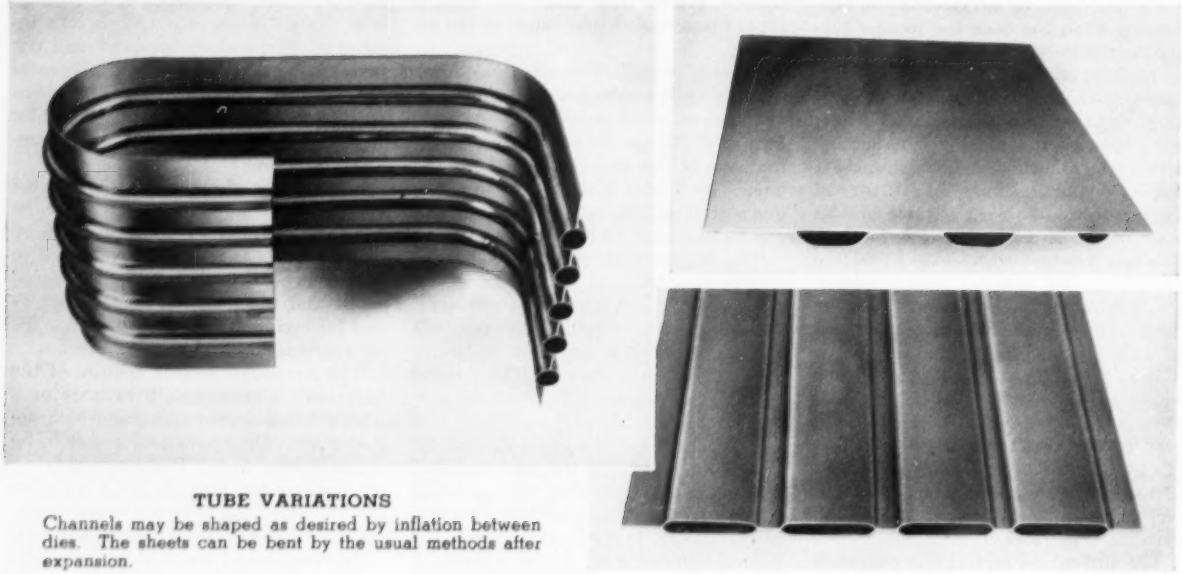
Ingersoll-Rand spent three years developing the torque control feature. Besides company engineers, technologists from the Armour Research Foundation, Chicago, Ill., were involved, as well as Henry Harrison, a New York consultant formerly with Bell Telephone Laboratories.

The company had previously worked with the hammer rebound idea, but with the standard anvil or socket driver rebound was erratic and efforts to shut off the tool at the proper time were unsatisfactory. It was found that by introducing an additional anvil member, that could be preset to a certain torque value, hammer rebound was materially increased and could be used to trigger the shutoff.

THE SMALL SIZE

The 5040T tool shown here has an adjustable torque range up to 90 foot-pounds, an average working speed of 1050 rpm and impacts on an average 2100 times a minute. It weighs only 6¼ pounds and is therefore easy to handle and suitable for various assembly-line operations. It is pictured, left, with a screw driver adapter tightening ⅜-inch Allen head screws on the gear-case cover of a diesel engine and, right, running a 9/16-inch cap screw to 85 foot-pounds torque to fasten an engine support pad to a transmission. Other sizes of the Torque Control tool will be available soon.





TUBE VARIATIONS

Channels may be shaped as desired by inflation between dies. The sheets can be bent by the usual methods after expansion.

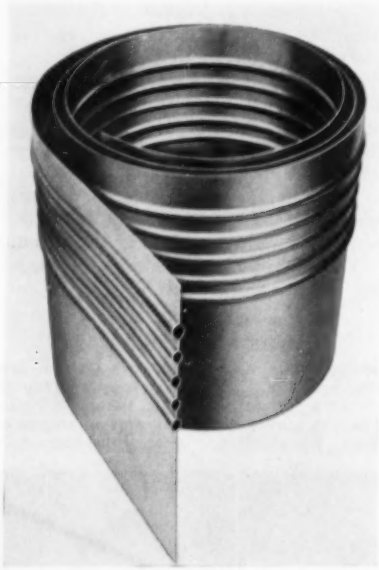
New Material Combines Tubes and Sheets

SHEETS of metal incorporating multiple, parallel tubes at regular intervals are a new product announced by Revere Copper & Brass Incorporated. Called Tube-In-Strip, it is expected to have numerous applications in the heat-exchange field, including refrigeration and air conditioning; chemical, food and petroleum processing; automobile radiators, water heaters and coolers and gas heaters; and radiant panel heating. So far it has been made of copper, brass and aluminum, but it is expected that stainless steel and other metals will be added to the list.

The combination tubes and sheets can serve as structural members in many cases and make the designer's work easier. It has, in fact, been suggested that the material be used to build the sides of van-type trucks, fire walls in ships and nonload-carrying walls elsewhere. It can also be utilized as cable conduits because it is possible to produce it in great lengths.

Of as much interest as the product itself is the way in which it is manufactured. In contrast with some other similar materials already on the market, Tube-In-Strip is made from one sheet of metal and not by welding or brazing two thicknesses together and then forming tubular passages between them. Revere officials emphasize that it is not a specialty but a mill product that can be turned out almost as fast and as cheaply as ordinary rolled sheet.

The openings are produced by inflating certain sections of the sheet that are rendered separable by the inclusion of a material at the time the casting is made in the foundry. Strips of the material are suspended in the mold when the metal is poured, their size and spacing determining the number and width of the tubes in the final product. When the cast ingot is rolled in the direction in which the strips run, the embedded material is elongated and flattened to form laminations within the metal.



IN COILS

Tube-In-Strip can be inflated in a coil of any desired length and will ordinarily be shipped in coil form uninflated, as the lower half of this picture shows. Strip is furnished in widths up to 16 inches in copper or brass and up to 30 inches in aluminum.

The rolling process converts the internal strips into a powder and thus forms zones where separation can be effected by introducing air or other fluid under pressure. Sheets up to 5/1000 inch in thickness are normally expanded with compressed air up to 150 psi. For greater thicknesses, which so far range up to 30/1000 and 50/1000 inch, either water or oil is applied at pressures from 10,000 to 20,000 psi.

Plants that use considerable quantities of the Tube-In-Strip are expected to buy it uninflated in the form of coils and to open up the channels in their own shops. The sheets can be bent into desired shapes either before or after the tubes are expanded. Practically all industrial establishments have compressed air available capable of inflating the lighter-gauge materials, and hydraulic equipment suitable for developing 10,000 psi pressure can be obtained for around $3000, a Revere official states.

Tubes can generally be spaced as close as ¼ inch, or as far apart as the width of the metal sheet permits. They are approximately from 3/16 to 5/8 inch in inside diameter, with wall thicknesses ranging from 25/10,000 inch to whatever the inflating equipment can handle.

By suitably controlling the sizes and positions of the strips incorporated in the original casting, tube diameters and their spacing in the final product can be varied within a single sheet, as desired. Ordinarily, tubes are circular in section, but by inflating them between dies they can be given flattened sides, or it is possible to have all the channels on one side of a sheet, leaving the other side flat.

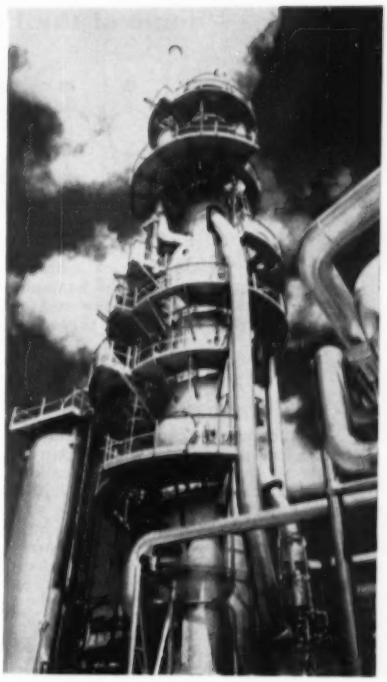
BUILDING BETTER PETROLEUM PRODUCTS

Man uses heat, pressure and catalytic-aided reactions to regroup petroleum molecules into myriads of different products

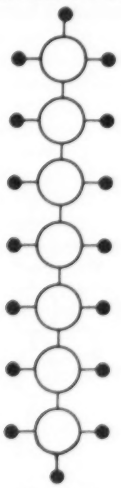
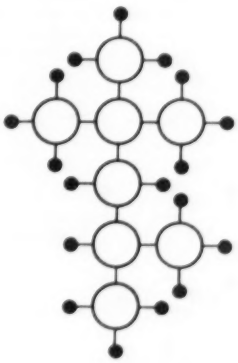
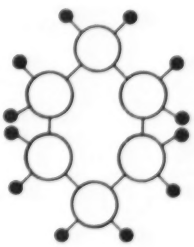
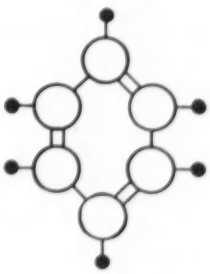
R. J. NEMMERS

IN REFERENCE to petroleum products the word *building* seems to be somewhat of a misnomer, but in practice that is exactly what present-day refiners are doing. By taking crude oil apart—separating it into atomic-size building blocks—and then putting the parts together to form molecules of other desirable hydrocarbons they are producing high-octane motor and aviation fuels in quantities undreamed of fifteen years ago. Besides that they are able to make large amounts of aromatic hydrocarbons such as benzene and toluene and thus, because these products were in very short supply not too long ago, alleviated a situation that actually constituted a menace to the nation's economic and defensive welfare.

The story of how these seemingly magical transformations are achieved is a fascinating one in itself that cannot be treated fully in the available space. We can, however, explain some of the more recent and most important processes by taking a look at the Universal Oil Products Company, one of the organizations in the field devoted to research and to the development of new means of building better petroleum products.



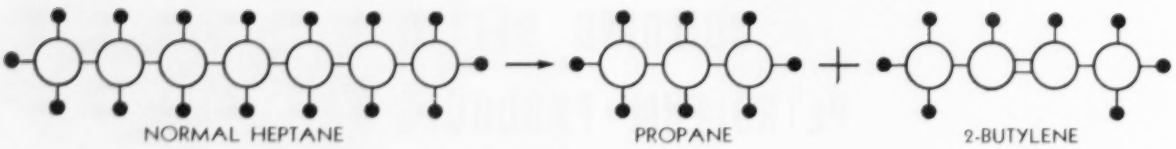
"CAT" CRACKER
Upper section of a Universal Oil Products catalytic cracking unit that does an efficient job of reforming petroleum molecules.

NAME	NORMAL HEPTANE	ISOOCTANE	CYCLOHEXANE	BENZENE
STRUCTURE				
SHAPE	STRAIGHT CHAIN	BRANCHED	RING	RING
OCTANE	POOR (0 octane)	EXCELLENT (100 octane)	FAIR	EXCELLENT
CHEMICAL FAMILY	NORMAL HEPTANE	ISOPARAFFIN	NAPHTHENE	AROMATIC

REPRESENTATIVE HYDROCARBONS IN THE GASOLINE RANGE

Ordinary gasoline is made up of hundreds of hydrocarbons of differing molecular construction. In general, the straight-chain molecules produce "knock" in an engine, while the branched-chain or ring-type molecules do not. In the diagrams above, the open spheres represent carbon atoms and the solid ones hydrogen atoms. The straight chain at the left is a molecule of normal heptane (C_7H_{16}), which knocks under almost any condition and, consequently, makes a very poor gasoline component. Pictured next to it is a molecule of isooctane (C_8H_{18}) which, although it differs but little from normal heptane in the number of its carbon and hydrogen atoms, produces a minimum of knock. The way the atoms are arranged makes all the difference. The two other molecules, benzene (C_6H_6) and cyclohexane (C_6H_{12}) are generally similar in construction but vary greatly in octane potential.

Some of the Processes for Reforming Petroleum Molecules

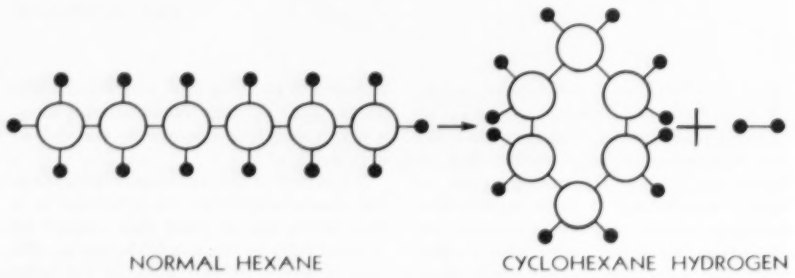


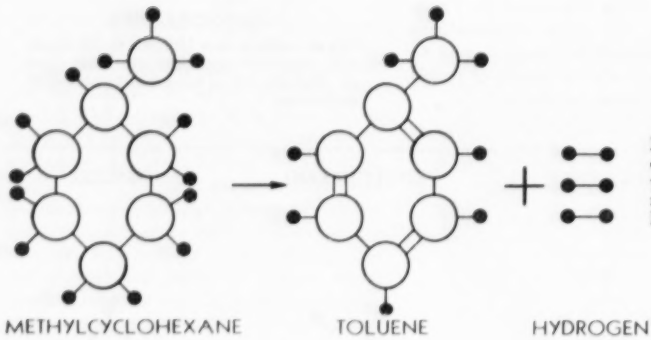
CRACKING

Cracking makes two or more smaller molecules out of one bigger one. In the example above, normal heptane is converted into propane and 2-butylene. Cracking can be carried out in the presence of hydrogen, in which case it is called hydrocracking. Because of the cost of obtaining hydrogen and the complicated operations involved, this process is not being used commercially on a large scale.

CYCLIZATION

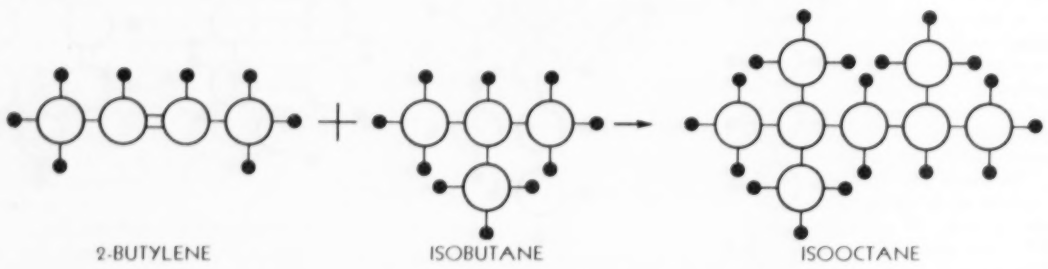
Cyclization is a method of making rings out of straight chains. If hydrogen is given off in the process it is called dehydrocyclization. In the example, normal hexane is rearranged into cyclohexane. To keep the chemical balance of the molecule two atoms (one molecule) of hydrogen must be released. Hexane is a paraffin; cyclohexane is a naphthene and therefore has a higher octane value.





DEHYDROGENATION

Many naphthenes can be upgraded in octane value by converting them into aromatics. In this illustration methylcyclohexane is converted into toluene by removing three molecules (six atoms) of hydrogen—hence the name dehydrogenation.

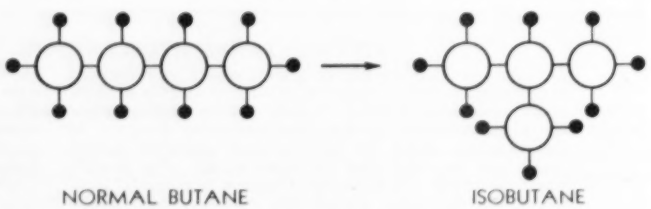


ALKYLATION

Alkylation is a synthetic process by means of which gases produced in certain cracking operations can be converted into high-octane blending components for aviation gasoline. In the example, 2-butylene and isobutane are converted into isooctane. Universal Oil Products HF Alkylation, a special method, uses hydrofluoric acid as a catalyst.

ISOMERIZATION

An isomer of a chemical compound is a substance which is made up of the same elements as the original or reference compound and in the same proportions. Generally, isomers have the same number of atoms as their normal counterparts such as this example in which normal butane is converted into isobutane. Isomerization, then is a rearrangement of atoms in a molecule. Isomers, because their molecular structure differs, have different properties than their "plain" counterparts and frequently have higher octane numbers.



Universal Oil Products Company, known as U.O.P., pioneered the use of platinum in the catalytic reforming of low-octane into high-octane gasoline. This process is called Platforming, and also serves to make aromatic hydrocarbons. The concern had a hand in working out the method of fluid catalytic cracking that proved so valuable during the last world war in supplying the Allies with 100-octane aviation gasoline. Other processes indispensable to the refining industry that have been developed and are licensed by U.O.P. are polymerization, alkylation, isomerization and, just announced this year, Rexforming. Still others include Unifining, Udex and Unisol.

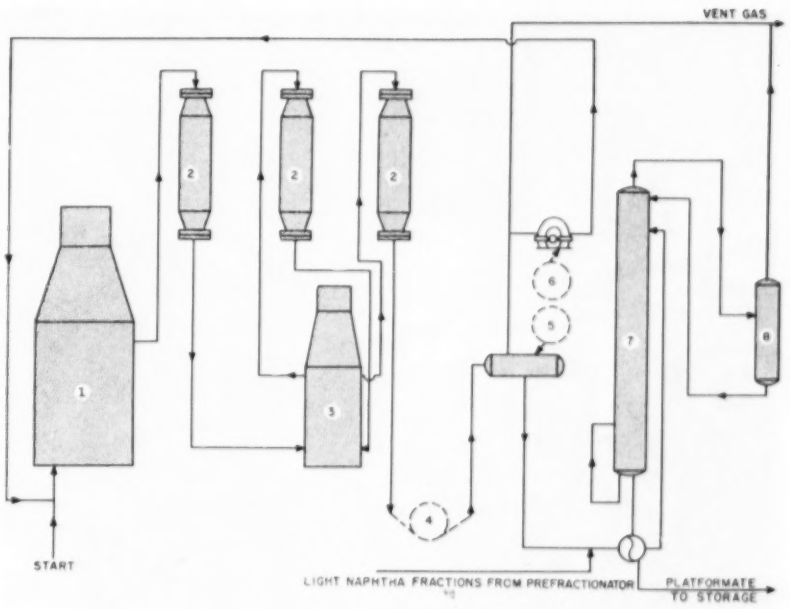
The present corporate setup of U.O.P. is novel and of interest. The company was founded in 1914 to market and license the Dubbs thermal-cracking process—one of the first of its kind and which is credited with having revolutionized the refining industry. Originally financed by private capital, the firm was sold in 1931 to a group of major oil companies. The latter established the Petroleum Research Fund in 1944 and turned over their holdings in the concern to a trustee on behalf of the fund. All income therefrom is distributed for advanced scientific education and fundamental research within limited fields, as set forth in the trust agreement, and administered by the American Chemical Society, the present qualified recipient. U.O.P. also maintains a subsidiary organization in this country—Procon Incorporated—which is a process-construction company. Since the parent firm was founded it has designed and engineered hundreds of petroleum processing units.

As the work done by the company's research staff can best be explained by describing the methods and what they accomplish, this article will be devoted to an explanation of certain refining operations and to the machinery used in connection with them. In the days of the first horseless carriages the only motor fuels were "straight runs," that is, gasolines derived solely by the thermal distillation of crude petroleum. They served fairly well; but later, when engineers began to build higher-compression, higher-speed power plants for cars, the straight runs knocked, at times very badly, and few engines developed the power that, theoretically, they should have.

Intensive investigation brought out the fact that knocking was caused by detonation of the fuel. If it burned slowly and steadily rather than exploded, there was no knock. Soon after that discovery was made it was learned that small quantities of tetraethyl lead added to gasoline improved its antiknock properties. In 1926 an arbitrary scale was set up by which the knocking tendencies of different gasolines can be compared. A hydrocarbon which never knocked even in the highest compression engines in use at that time was chosen and assigned a value of 100. It was trimethyl pentane (better known as isooctane and from which the name of the octane antiknock scale was derived). Another hydrocarbon, normal heptane, which almost invariably knocked even under the most favorable conditions, was then given a value of 0. This means that a fuel with a rating (octane number) of 80, for example, has the same antiknock qualities as a mixture composed of 80 percent isooctane and 20 percent normal heptane.

As time went by, additional hydrocarbons with antiknock properties even greater than those of isooctane were isolated and assigned numbers by extrapolation of the basic 0 to 100 scale, thus giving 100-plus values. And ever since it was established that gasolines of consistently high octane numbers could be produced, the efforts of engine builders to provide higher-compression, more efficient engines and of refiners to satisfy the demand for higher-octane fuels have taken on many of the aspects of a race. Needless to say, the two groups have worked together closely, and their cooperation is in no small part responsible for many of the improvements we now take for granted.

Crude oil, as it comes from the wells, is a rather useless material. It is only after it has been refined that it acquires many of the more valuable attributes which have led men and nations to seek it so eagerly. It is made up of hydrogen



PLATFORMING FLOW DIAGRAM

Straight run and/or cracked naphtha stock from a prefractionator or Unifiner goes first to the . . .

1 PREHEATER where it is mixed with recycled hydrogen from the other "end" of the Platformer and where its temperature is brought up to operating conditions. It then travels to the . . .

2 CATALYST BEDS where reforming takes place. The catalyst is divided into a series of beds, and because the reactions are of the endothermic type (heat absorbing) the stock is reheated between each bed in the . . .

3 INTERMEDIATE REHEATER where the temperature is raised each time to the operating condition. After leaving the last catalyst bed the stock passes to the . . .

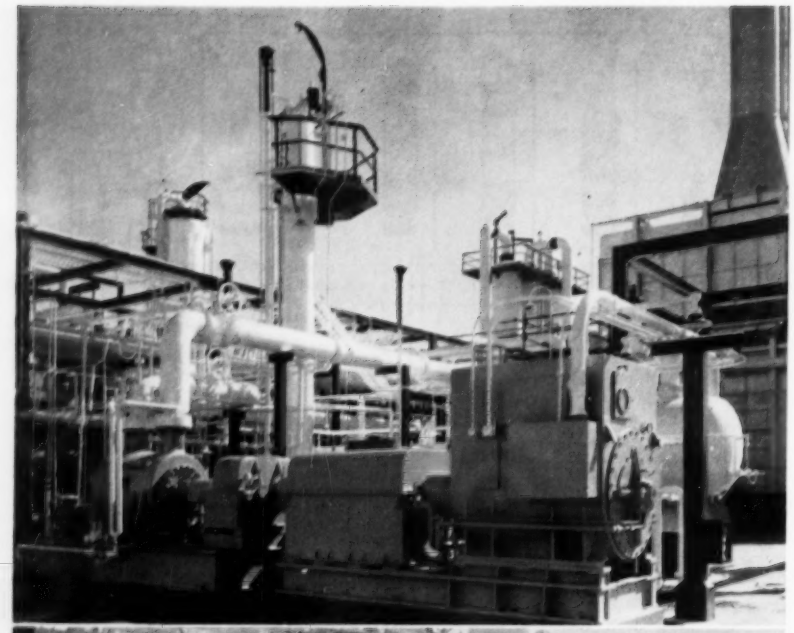
4 HEAT EXCHANGERS where it gives up much of its latent heat and is condensed to a fluid. From there it flows to a . . .

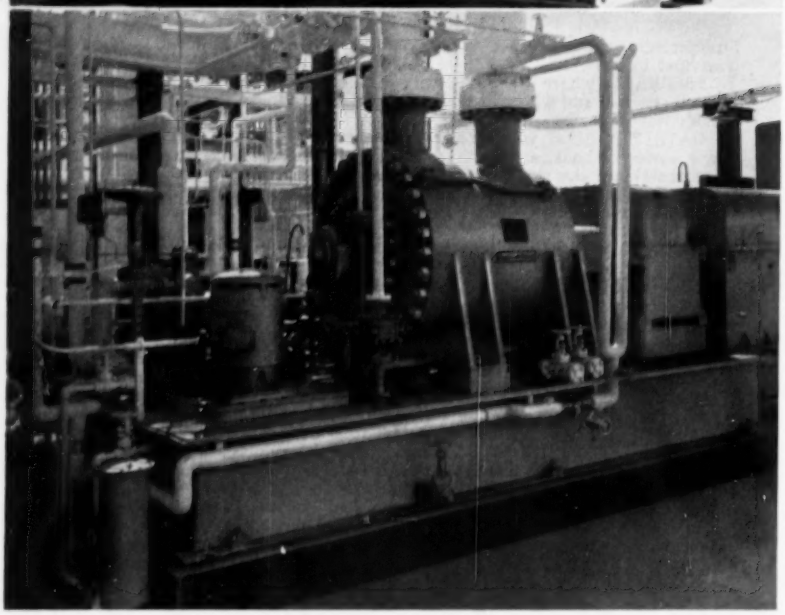
5 SEPARATION DRUM where liquid and gaseous components are separated. Part of the hydrogen gas is picked up by the . . .

6 RECYCLE GAS COMPRESSOR and returned to the preheater while the remainder or net "make" of gas is vented from the system. (This excess hydrogen can be used as refinery fuel, as a purifier in a Unifining system or for other chemical purposes such as the production of ammonia.) The liquid product from the separator (5) goes to a . . .

7 STABILIZER where a product of the desired end volatility is produced by distilling off the lower boiling ends. Gas from this point is sent to the . . .

8 STABILIZER REFLUX DRUM where any liquid product is recycled through the stabilizer. The end gas product is vented from the system; the end liquid product is transferred to storage as finished gasoline. Light naphtha fractions taken from the prefractionator may be added and included with the finished product at the entrance to the stabilizer. Because these fractions have high octane values they need not go through the remainder of the Platformer.





COMPRESSOR SERVING A PLATFORMER

These views show the Ingersoll-Rand centrifugal compressor that handles the recycle gas stream in a Platforming unit at The Union Oil Company of California's Oleum refinery. The machine is fitted with oil seals of special design to prevent leakage of the hydrogen-rich gas. It operates at 7950 rpm and is driven by a General Electric motor running at 1750 rpm through a 4.55-to-1 speed increaser. The motor delivers 3500 hp, is totally enclosed and force-ventilated by 3-psi instrument air rather than an integral fan. In the upper picture the motor is at the right, a fluid-drive coupling is next, the speed increaser follows and the compressor is last in line. The tower just left of center contains the reservoir for the oil-seal system. The other view shows the compressor at close range.

and carbon atoms, and these may be combined to form literally thousands of compounds. It is also a fact that crudes from different fields are not at all alike; some have large quantities of aromatics, others have but a few, etc.

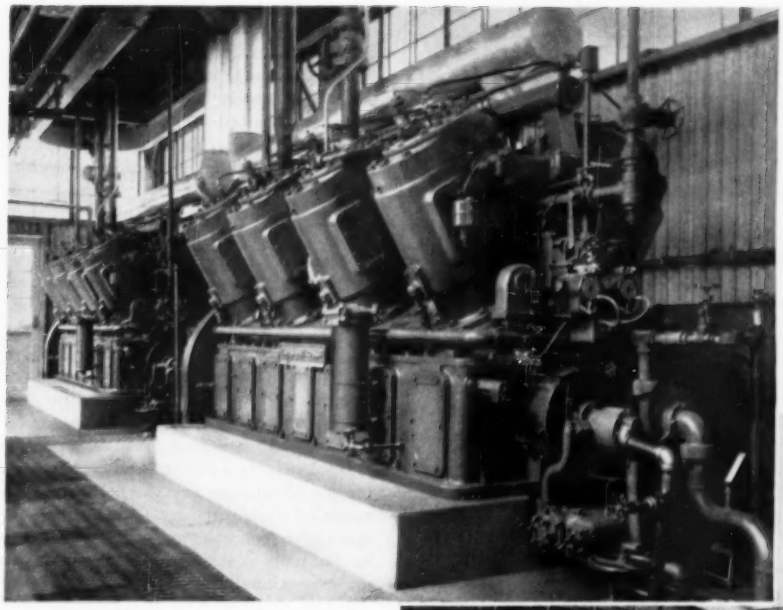
Straight-run gasolines derived from crude petroleum have octane ratings of from 2 to 75—most of them are in the lower brackets. If we were forced to rely solely on these fuels to meet the requirements of even the lowest-compression car engines on the road there wouldn't be nearly enough to go around. The octane number, of course, depends on the kinds of molecules in the gasoline. There are many of them, but for our purpose it is necessary to mention only two ring-shaped varieties (aromatic hydrocarbons and naphthenes) and the branched chains (isoparaffins). These are of high-octane rating and add quality to the fuel. The straight chains (paraffins) detract from gasoline.

Because most straight-run fuels contain a large percentage of the straight-chained type, means had to be found to upgrade them—make them into branched chains or into rings. Scientists have discovered many different ways of reforming hydrocarbon molecules, and some of the more important ones are listed elsewhere in this article along with definitions and illustrations showing what happens to representative molecules when they are torn apart and rebuilt.

Before World War II started in Europe the only commercially available gasolines had octane ratings of about 80 to 87 and were generally produced by adding tetraethyl lead to 75-octane thermally cracked stock. Then, in rapid succession, came a series of developments that led to economical methods of making 100-octane gasoline. As they have been detailed previously in this magazine (May 1945) we will pass over them lightly and mention only isomerization, alkylation and fluid catalytic cracking. (U.O.P. originated some of them and had a hand in others. A good many of the fluid cat-cracking and alkylation plants now in operation use its processes.)

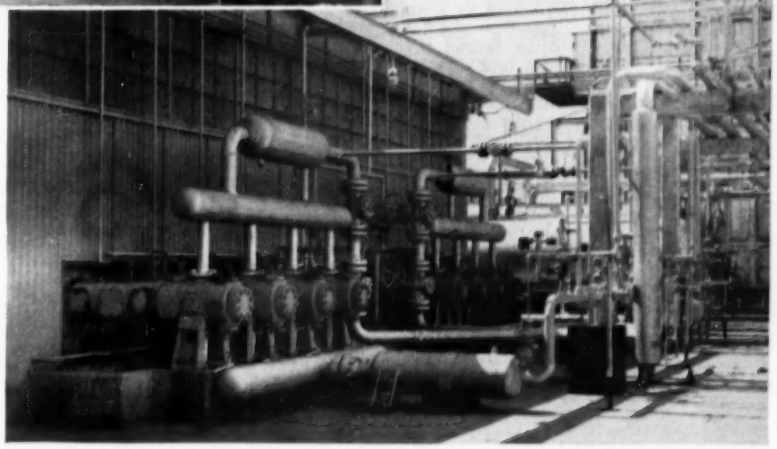
It was 100-octane aviation gasoline (avgas) that helped the Royal Air Force defeat Hitler's Luftwaffe; Germany had only 87-octane gasoline, and the difference in quality enabled the Allies' planes to fly faster, farther, and higher. Then, too, the new methods made it possible to extract about 45 barrels of high-grade "gas" from each 100 barrels of crude, in comparison with the approximately 20 barrels obtainable by other means. And fluid catalytically cracked stock is highly desirable for blending in producing high-octane gasoline.

The idea of catalytic reforming had been kicked around by the petroleum industry for many years before it ever amounted to much. But when it did, it went over in a big way. After the war much experimenting was done to find and test new catalysts and to determine new ways of applying them. Early in 1949 Universal Oil Products introduced to the trade a revolutionary process that gained almost immediate acceptance and has become one of the most important of the reforming methods serving the petroleum industry. Called Platforming, it makes use of and derives its name from a platinum-containing catalyst and enables refiners to manufacture gasoline of superior over-all qualities, as well as



HYDROGEN COMPRESSORS

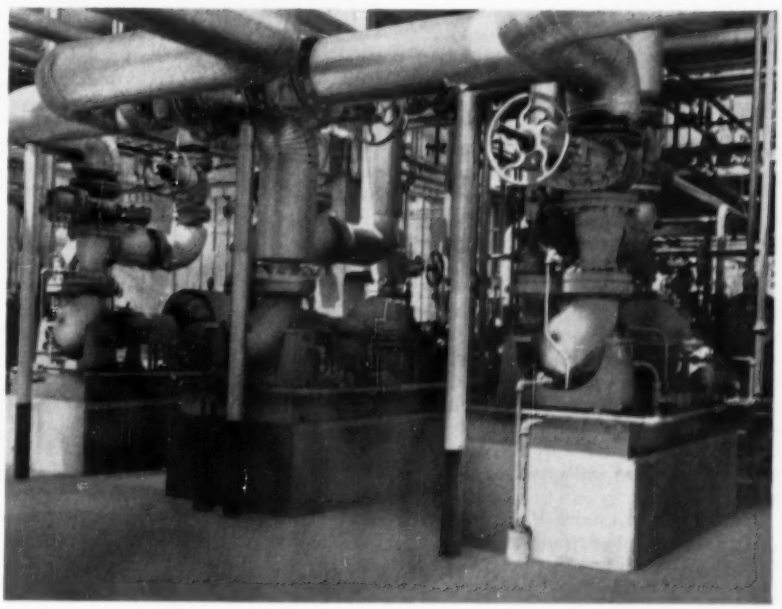
Reciprocating compressors such as these can be used to supply hydrogen to a Platforming unit. At the left is a view of the indoor sections of two Ingersoll-Rand Type XVG gas engine-driven machines that supply gas to a Platformer at 850 psi pressure. The compression cylinders, which are of the nonlubricated type, are outside of the building (picture below) and are separated from the driving cylinders and main frame by a fire wall. These units are part of the first commercial combination Platforming and aromatics-recovery plant built by Cosden Petroleum Corporation.



of high octane. In fact, it may be said that Platformate (Platformed gasoline) is an entirely new motor fuel. Its road-performance rating is exceptionally high, and because of its cleaner burning characteristics engines stay cleaner and run smoother, with resultant less wear.

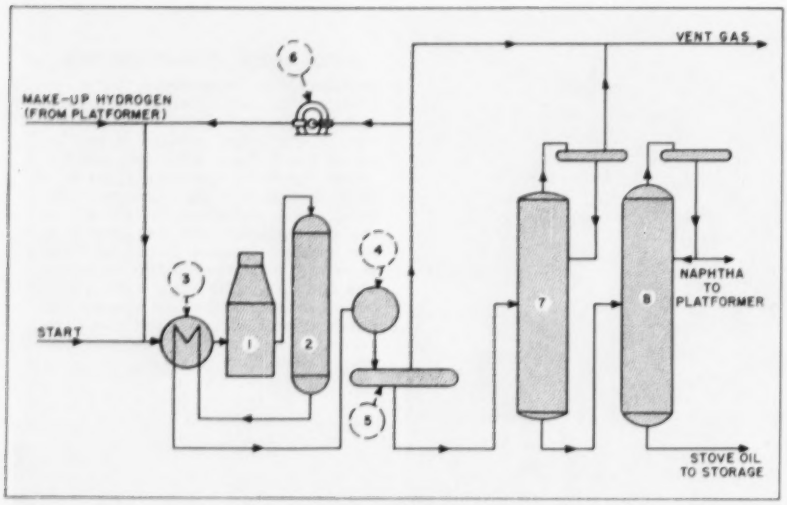
The Platforming process requires no selected or extensively treated charge stock to produce premium motor fuels (about 85 to 95 octane, depending on the market). Straight-run and/or cracked naphthas boiling in the range of 150 to 400°F can be used, and the procedure may be varied to turn out gasoline of any quality within wide limits up to 100 octane. It should also be noted that Platformate is very stable as it comes from the processing equipment and needs no aftertreatment. In addition, the yield of end products is exceptionally high and costs are low. Besides upgrading low-octane naphthas, it is possible by means of Platforming to obtain a large amount of aromatic hydrocarbons from select naphtha cuts and to make high-quality avgas blending components.

As this article includes a flow diagram with descriptive text showing the main parts of a Platforming unit and explaining how gasoline is routed through it, we will discuss the method only briefly.



FORCE FEEDING A PLATFORMER

A Platforming unit swallows a lot of feed stock in the course of a run and heavy-duty machinery is needed to supply it. Shown at the right are three Ingersoll-Rand vertically split, single-stage, single-suction centrifugal pumps that charge a Platformer with 560 gpm of feed stock against a head of 427 feet. The installation is part of Cosden Petroleum Corporation's Platforming unit for the recovery of aromatics at Big Springs, Tex.



UNIFINING FLOW DIAGRAM

For the production of stove oil and naphtha, stock is mixed with hydrogen from some outside source such as a Platformer and with other hydrogen recycled from the system. Then it goes to the . . .

1 CHARGE HEATER where its temperature is raised to operating conditions for transfer to the . . .

2 REACTORS where the desired chemical changes take place. The changes are catalytically induced and directed. From the reactors the stock flows to the . . .

3 FEED-PRODUCT HEAT EXCHANGER where it gives up some of its heat to the incoming charge stock, thus reducing the amount necessary to raise the charge to operating conditions. Thence it travels to the . . .

4 FINAL COOLER and to the . . .

5 HIGH-PRESSURE SEPARATOR where liquid and gaseous fractions are separated. The gas product enters the . . .

6 RECYCLE GAS COMPRESSOR where it is recycled to meet the incoming charge stock. Or it by-passes the compressor and is vented from the system. The liquid product from the separator (5) goes to the . . .

7 STABILIZER where a product of the required volatility is made. Gas from the stabilizer flows to another separator where any liquid carry-over is removed, recycled and vented. The liquid fraction leaves the bottom of the stabilizer and passes to the . . .

8 FRACTIONATOR where it is separated into naphtha to charge a catalytic reformer (Platformer) and into stove oil which is sent to storage. The naphtha which issues from the Unifining process is greatly improved in burning quality and susceptibility to catalytic cracking.

The four major process variables are temperature, pressure, space velocity and hydrogen recycle rate. These differ according to the chemical make-up of the charge stock and the desired end product. The reactor temperature is normally between 800 to 1000°F, and the pressure varies from 200 to 1000 psi.

The principal chemical reactions involved are: dehydrogenation of naphthenes to aromatics; hydrocracking of high molecular weight paraffins to lower molecular weight paraffins; isomerization of paraffins and naphthenes; and dehydrocyclization of paraffins. Also, sulphur is removed and converted into hydrogen sulphide. It is, of course, the presence of the platinum-containing catalyst which makes all this possible and which acts much like a traffic cop in directing the course and extent of each reaction.

Unfortunately, crudes from some fields are contaminated with a variety of elements that not only affect the quality of any finished hydrocarbon products derived from them but have a bad effect on the catalytic reforming reactions. To cope with these contaminants, Universal Oil Products and Union Oil Company of California developed a process known as Unifining that readily lends itself to the removal of sulphur, nitrogen, oxygen and metals from a wide variety of petroleum distillates and, in addition, results in certain improvements in the characteristics of the stock. It can be used to pretreat a lower-grade stock before charging a Platforming unit and also is of great value in upgrading petroleum fractions of different boiling ranges.

The method is economical and has an added advantage in that it can utilize the hydrogen obtained from the Platforming operations. It may be applied to fractions that differ considerably in boiling range—from gasolines to heavy vacuum distillates and either of the straight-run or cracked varieties. The accompanying flow diagram is arranged for the simultaneous production of a high-grade stove oil and a catalytic-reformer (Platforming) charge stock. The Unifining process was first used on a commercial scale in 1953 and since that time has been growing in importance.

As has already been noted, Platforming is well suited for making petroleum aromatic hydrocarbons and in quantities much larger than heretofore possible. These aromatics are vital to the petrochemical industry in the manufacture of certain plastics, synthetic rubbers, etc. But before the method could be applied to that task, some means had to be found to separate the aromatics from the non-aromatics in Platformate. U.O.P., working with Dow Chemical Corporation, came up with the Udex process by which this can be done easily and economically.

The new method takes advantage of a solvent that contains diethylene glycol and selectively dissolves and retains aromatics while rejecting the other components of Platformate. Then, in further steps, the aromatics are individually and successively distilled and recaptured in an exceptionally pure form. For the greatest flexibility, a Platforming unit can be run on a blocked-out basis—alternately producing aromatics and reforming poor-grade gasoline into high-grade motor fuel.

U.O.P., as its work on the Unifining and Udex processes proves, has not been content to sit back since the development of Platforming but has been continually engaged in finding more efficient means of reforming petroleum. In April of last year the company announced a new method called Rexforming that is based partly on Platforming but goes one step farther.

To understand just what has been done, let us go back a little and look at the composition of Platformate. First of all it contains a large quantity of aromatics and naphthenes which have high octane ratings. It also contains some isoparaffins which, like the aromatics, have good antiknock qualities. In addition there are a few heavier straight-chained components. The latter, even though present in the small quantities which get by a conventional Platformer, act as a depressant on the total octane rating of the end product. In other words, U.O.P. engineers knew that if they were to boost the octane ratings of Platformate any substantial extent they would have to find some way of removing the low-grade paraffins that cause the trouble. They turned to a solvent extraction process that collects the aromatics, naphthenes and isoparaffins but leaves the straight-chained paraffins behind. Furthermore, it was determined that the part of the stock rejected by the solvent could be recycled through the catalyst beds and again upgraded. And this, as well as petroleum reforming, is what the Rexforming process does.

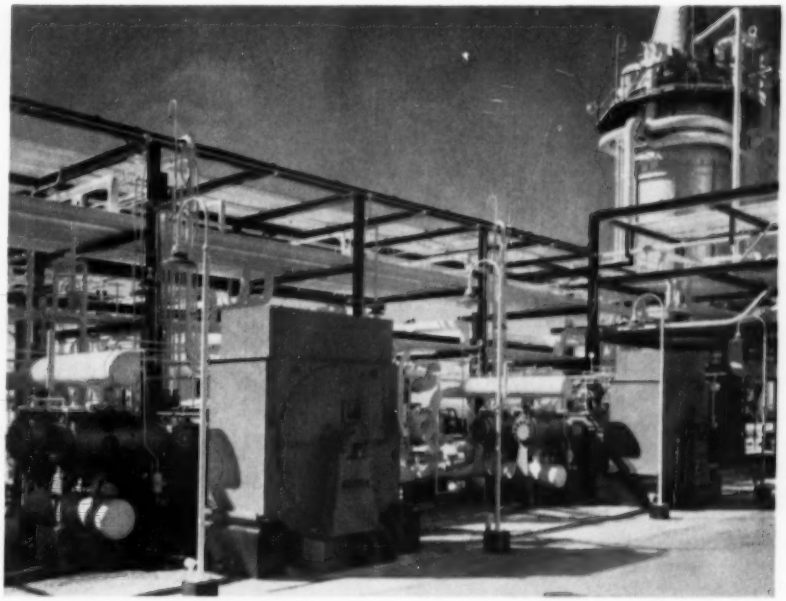
It is believed that Rexforming will play a big part in the plans of many re-

finers contemplating either the construction of new units or the remodeling of old ones, with particular emphasis on the latter in the near future because companies with Platforming units already installed will be able to convert to Rexforming with the least expenditure for additional equipment.

Starting from scratch, a Rexforming installation that will reform 4300 barrels per day of Mid-Continent, full boiling, straight-run gasoline into 101 octane (unleaded) Rexformate can be built for about $300 per barrel of daily capacity, and it will cost about 36 cents per barrel to operate the unit. Actually, the process reduces the cost of manufacturing higher-octane hydrocarbons.

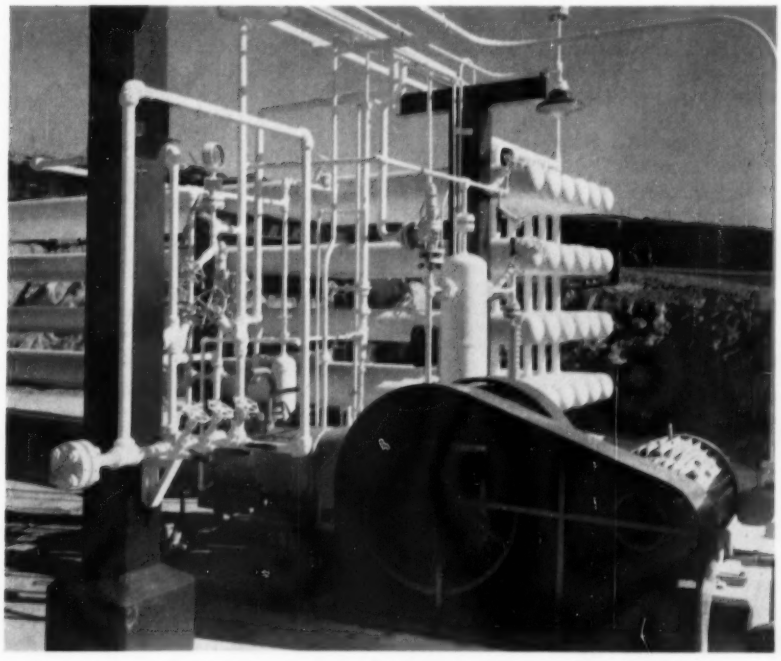
As in Platforming, hydrogen is a by-product of the Rexforming process, and values derived from it must be taken into account in figuring the over-all cost. It can be used as fuel in charge heaters, as make-up gas for a Unifiner, as raw material for an ammonia plant, etc.

One of the things that serves to keep expenditures down is the fact that minor amounts of aromatics can be left in the recycle stream without affecting the efficiency of the over-all system. This enables a refiner to use a less rigorous extraction section and, therefore, one that does not cost so much as the systems required to separate virtually all the aromatics from a mixture and to keep them pure. What is more, the process operates at very mild pressures and temperatures compared with certain other methods, and thus can give a higher yield.



COMPRESSORS FOR UNIFINING

The Unifining process needs compressors, among other things, for the compression and transfer of the gas product coming from the separator drum and also of the make-up gas fed into the system. Illustrated is a unique arrangement of two Ingersoll-Rand Type HHE compressors used for both purposes. Each machine has three 7½x12-inch cylinders, two of which handle the separator gases while the third takes care of the make-up gas, and is driven by a General-Electric 600-hp, totally enclosed, inert gas filled motor operating at 400 rpm. The horsepower requirements for both services are approximately equal. This view shows the separator-service cylinders on both units. The installation is at the Oleum refinery of The Union Oil Company of California.



TRIPLE-SERVICE COMPRESSOR

This compressor performs three tasks for a Platforming-Unifining installation. It pumps hydrogen from tank trucks to storage, from storage to the reforming system, and from the latter back to storage at the end of a run. The Ingersoll-Rand 9-inch-stroke machine operates at 3300 psi discharge pressure. The banks of pipes in the background make up the storage system.

The flow diagram of a Rexforming unit differs little from the one shown for Platforming, except that an extraction section is utilized after the stabilizer. The overhead product issuing from the extractor is recycled—returned to the catalytic reactors after mixing with the fresh incoming stream. This is known as the low-octane stream, while that which has gone into solution is called the super-octane stream, or Rexformate, which is removed from the solvent by a stripper and sent to storage.

Regardless of the quality of the charge stock, Rexforming makes it possible for a refiner to manufacture either an end product of any desired octane rating or aromatics, and to do so economically. With the new process, U.O.P. has approached the long-sought way of upgrading all the constituents of a charge stock and of handling a wide variety of stocks. Before long we are sure to see Rexforming applied in many refineries in this country and abroad — will probably witness many improvements in the process — and learn of new concepts in the technique of reforming petroleum. Universal Oil Products Company is, indeed, a builder of better petroleum products.

A NEW RESIDENCE

Hundreds of substantial homes have risen in Farmington during the past three years, many of them on land that formerly grew peaches. Here and there is one fashioned along more palatial lines, like this one.

The Town that Gas Built

Farmington, N. Mex., Has Grown Fivefold in Five Years

CLEE WOODS

FARMINGTON, located in New Mexico, is the little wonder city of America. Gas has done it. Oil and uranium have helped. They're going to help more. From a 1950 population of 3472 the community has run up close to 20,000, counting the people in the immediate environs. The payroll of one Farmington gas company alone, El Paso Natural Gas, is not much under $4,000,000 a year. There is continual expansion everywhere throughout the city.

APACHE RECREATION

The Jicarilla Apache Indians stand to profit handsomely from the gas and oil discoveries on their tribal lands. Here they are shown attending a fiesta dance.

Southern Union Gas Company began feeding gas from the Kutz Canyon area to Albuquerque, N. Mex., in 1929. It was a big effort for a baby outfit; now it is a little giant, and growing. Within the last three years El Paso Natural Gas Company completed a 24-inch line to California, and more recently the Pacific Northwest Pipeline Company connected its great line with Washington and Oregon. These systems have jumped gas activity in the San Juan Basin around Farmington to major proportions. Some 1200 wells pour gas into communities all through the Rocky Mountains and the West Coast.

Experts believe that the 100 producing oil wells now in this area are only the beginning of big things to come when wildcatting brings in money-makers from the Dakota sands at a depth of approximately 7000 feet and, most likely, from the Pennsylvania horizon at 9000 to 12,000 feet. This tremendous field, always widening, now extends for a length of nearly 150 miles from the Four-Corners Country—the only spot in the United States where four states corner—across northwest New Mexico to the Jicarilla Apache Indian Reservation better than 75 miles southwest of Farmington. It's half as wide, measured south from the Ute Indian town of Ignacio, Colo.

The Utes suddenly find themselves with pockets full of money from royalties. The Jicarilla Apaches, too, are reaping royalties. The Navajos are getting a little per capita, but this tribe is so numerous—some 65,000—that it will

take a lot more wells to fatten individual Navajo bank accounts. But uranium mines on their lands west of Shiprock and down in the Haystack Mesa region promise heavy revenues soon. A $60 million uranium plant that is going into production at Shiprock, just west of Farmington, makes this promise look like a certainty.

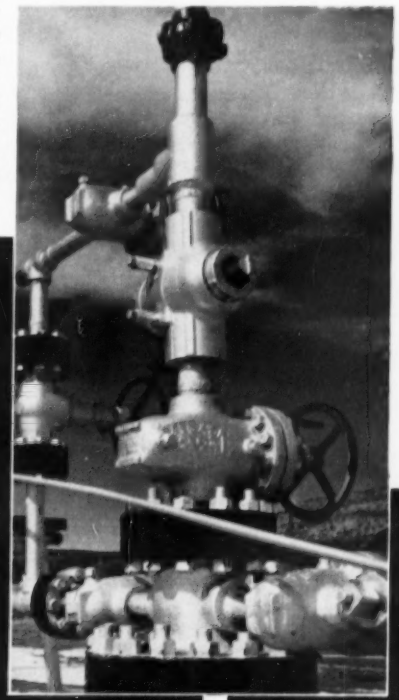
Once more the United States witnesses the strange twist of fate that brings rich royalties to Indians whose fathers long ago were crowded back onto lands the white man adjudged worthless. Today we're letting them keep what we gave them. Utes and Apaches now go into Farmington, Durango and other nearby cities with a hearty will to buy and money to pay. They're learning how nice it is to walk into a restaurant, eat a good meal and leave the dishes for the white people to wash.

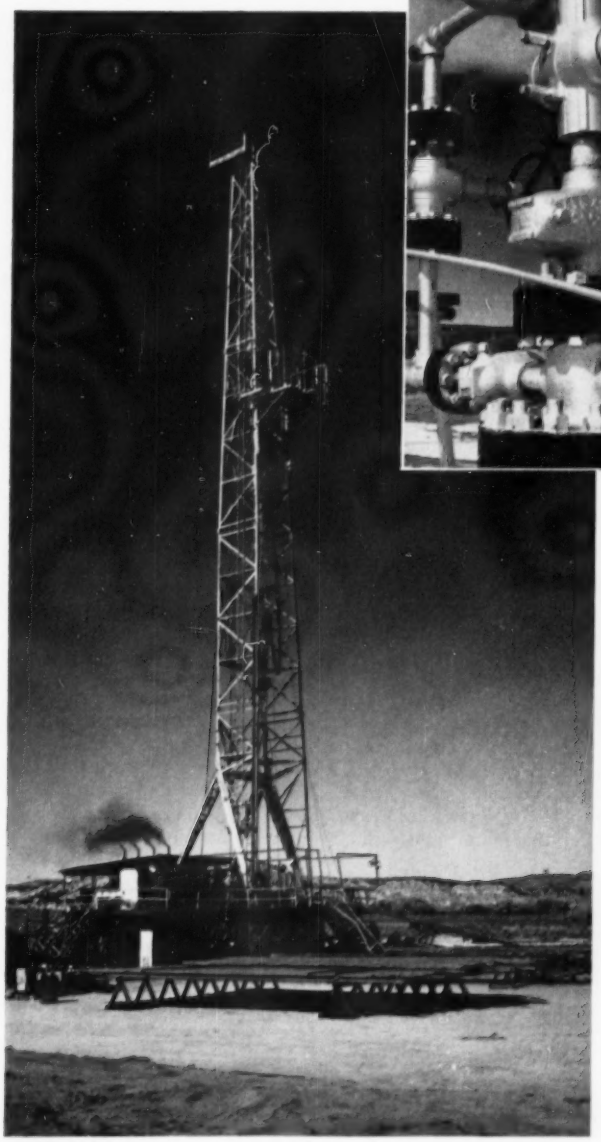
The Indian Service of Uncle Sam is successfully directing goodly sums of this new money into projects that will yield tribal benefits. But whiskey, now available to these Indians by law and economic conditions, is hitting them fearfully. Farmington is trying to meet this challenge to help the red man while at the same time profiting from Indian money. The community is also coping ably with the problem of juvenile delinquency among all racial groups by supervised playgrounds, swimming pools, various activities and general concern for youth welfare.

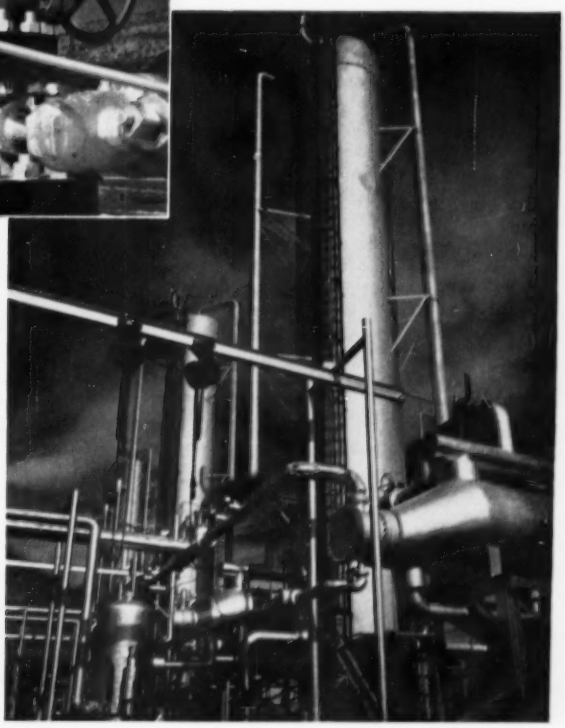
Farmington is facing its amazing boom with solid good sense. Its new homes are mostly beautiful, permanent structures. When a new section is promoted, the houses are well diversified in architecture, the streets stay away from monotony by graceful curves and frequent little parks, and lawns and trees go in with the last nails.

The city has just spent about $3,000,000 for paving, sewers, water, electric plants and a municipal airport. San Juan County has a new 44-bed hospital costing $600,000. A high school is being completed at an expenditure of $1,800,000. The airport is the hub of the Frontier Airline system. It has ten flights daily—Salt Lake City to Albuquerque and Denver to Phoenix—with transcontinental connections. Private planes, most of them identified with gas and oil, take off and land there with monotonous regularity.

Farmington truly is worthy of its petroleum and mining boom. Its leaders work as if possessed with a sense of destiny. Gas and oil are making Farmington wealthy, yes, but this little wonder city has other riches in the character of its people.

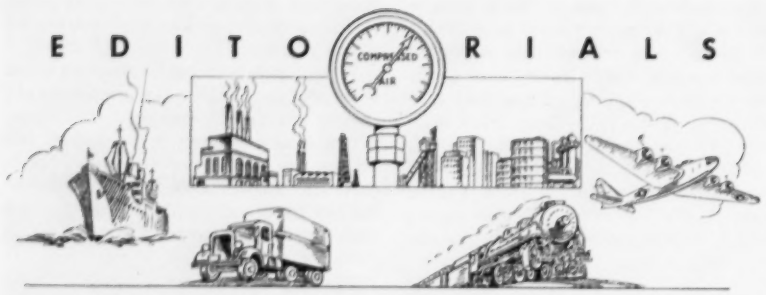






SYMBOLS OF NATURAL WEALTH

On the left is an El Paso Natural Gas Company drilling rig. Above is a section of the Barker Dome gas treatment plant of the Southern Union Gas Company, pioneer producer in the area. The "christmas tree" of high-pressure piping and valves that holds the gas captive in Barker Dome Well No. 9 is pictured at the top.



CRUSADE FOR FREEDOM

ONE doesn't often think of compressors in connection with humanitarianism, but these indispensable industrial machines are performing a worthy service for the Crusade for Freedom. At undisclosed launching points along the western borders of the group of Russian satellite countries in Europe they are providing buoyant hydrogen gas to inflate myriads of balloons that are released to rise and drift eastward with the help of prevailing winds. Every month the balloons carry as many as twelve million miniature newspapers behind the Iron Curtain to combat and refute Communist propaganda.

As everyone should know by now, the balloon barrage is one of two potent weapons used by the Crusade to bombard Communist-controlled nations with words. The other broadcasting instrument is the radio. Twenty-eight transmitters and relay stations, one of them the most powerful in existence, are on the air twenty hours a day beaming carefully prepared statements to the 70 million people of Poland, Czechoslovakia, Hungary, Romania and Bulgaria.

Radio thus bears the brunt of the job, but balloon-borne newspapers have certain advantages over the air-wave technique. You can't send a photograph into a man's home by radio, but you can print pictures in a paper, and pictures can sometimes convey facts better and more convincingly than can words. For example, when Communist propaganda misrepresents conditions in any part of the free world it is sometimes possible to scotch such reports effectively by reproducing photographs depicting actual conditions.

Crusade for Freedom is a prodigious undertaking that requires large sums of money. The organization maintains a staff of some 2000 persons. Every broadcast from 47 Communist radio stations is listened to carefully, and 62 daily newspapers and 641 magazines and weekly newspapers are read regularly. As fast as any of these sources make misstatements they are answered with facts, supported in many instances by photographic illustrations.

Crusade for Freedom is appealing for funds with which to continue its program. Those who are unfamiliar with the situation sometimes ask why the Government doesn't finance this effort. The answer is that the program would not carry the same force as it does now. It is important that the people who receive these messages realize that they are paid for by the voluntary contributions of millions of Americans, ranging from newsboys on up. They are then more assuring and more moving. Words reaching them from some of their own exiled citizens and from Americans in all walks of life are far more impressive than would be government-inspired and canned material that would very likely be catalogued as propaganda.

The business press of America, through its affiliation with The Advertising Council, Inc., is sponsoring this fund-raising campaign as one of its public service projects for 1956. The movement has the full support of prominent men and women of all religious faiths from President Eisenhower on down. It is also favored and endorsed by scores of the nation's leading organizations ranging from the Boy Scouts to the American Federation of labor and from the Farm Bureau to the Veterans of Foreign Wars. Contributions may be sent to Crusade for Freedom, 345 East 46th Street, New York 17, N. Y.

THE ASWAN DAM

THE following reference to irrigation appears in the first book of the Bible: "And a river went out of Eden to water the garden." Historians generally agree that the stream originated in Egypt. In any event, the Egyptians are known to have been practicing irrigation for a long time—perhaps longer than any other peoples. Some authorities think the science was developed there and that drifting Mohammedans carried the knowledge to other lands. It is pretty definitely established, for instance, that the Moors introduced it to Spain.

Egyptian life revolves around the Nile, without which the entire nation would virtually be a vast desert. In the beginning only the flood waters that escaped from the river's channel were available for watering crops. Then, by throwing up dikes in a rectangular pattern the peasants divided their land into basins, some of them containing up to 50,000 acres. The basins were filled up when the Nile overflowed, and after the ground was saturated the remaining water was released and seed sown. By this method, which is still followed in some areas, only one crop can be grown yearly.

What is known as perennial irrigation was started in earnest about 1820, when Mohammed Ali decided to cultivate sugar cane and cotton on a large scale. He built a canal some 200 miles long running parallel to the river. To divert water into the canal during periods of low flow, weirs were constructed. By thus making water available continually, three crops could be raised annually.

As the need for still more water developed, plans for a storage dam were considered and eventually resulted in the rearing of the famed Aswan Dam a few miles upstream from the Nile's first cataract. This idea was not new if we are to believe the Greek historian Herodotus, who recorded that even before his time (400 B.C.) water had been run into Lake Moreis during flood stage and drawn upon later. The Aswan Dam site was selected mainly because a dike of syenite granite crosses the stream there and provides a sound foundation. The dam was opened to service in 1902, increased in height between 1907-12 and has had a great effect on the economy of Egypt ever since. All told, more than 12,000 miles of canals carry Nile water to some six million acres of croplands.

Now there is a demand for still more water, and it is to be met by erecting a second dam about 4 miles upstream from the existing one. To whom Egypt will turn for financial assistance to defray the cost has lately been a subject of international discussion. It seems probable now that about $70 million of the $108 million needed to carry out the first stage of construction will be advanced by the United States and Great Britain, with Egypt raising the balance of $38 million. The estimated ultimate cost of the dam and the appurtenant irrigation and power generating features is $742 million. Studies indicate that Egypt's annual income will be increased by $630 million when the scheme becomes operative.

The dam is to be an integral part of a 10-year development program undertaken by the Egyptian government. It is expected that a rock-fill structure 3 miles long and 330 feet high will be built, providing a storage basin capable of holding 105 million acre-feet of water, or three times the volume that is impounded by Hoover Dam. Seven 54-foot-diameter tunnels are envisaged to divert the flow of the Nile during the construction period. Unlike Aswan Dam, the new structure will have no facilities for flushing out silt, and will, consequently, have its storage capacity reduced progressively by the deposition of stream-borne material.

Eight at One Stroke

Machine Molds Sausages by Assembly-line Method

REAR AND FRONT VIEWS

The top picture shows the production line, starting with the stuffer at the right which forces the meat under approximately 100 psi into the automatic molding and packaging machine. The latter is equipped with an 8-pocket mold (left) to eject flat, skinless pork sausages into boxes lined with cellophane. The Aro-matic is built throughout of aluminum, stainless steel and other nonrusting materials and is easy to dismount for cleaning at the end of a day's work.

PORK sausage is one of America's favorite breakfast foods, and now the housewife can buy it skinless put up neatly in a package containing eight one-ounce flat links that will not roll around in the skillet or on the broiler. She can also get a variety of other meats in 2-ounce patties four to a box. The machine that does the molding and packaging was developed by Basic Food Materials, Inc., Vermilion, Ohio, and is called the Aro-matic. Of the pneumatic type, it can be attached to any standard stuffer and obtains its air supply from the line that serves the latter.

The entire operation of the unit is controlled by a push button once the proper mold has been attached, the air pressure has been adjusted, the magazine has been loaded with folding boxes, and the valve that permits the meat to flow from the stuffer through a long coupling into the new machine has been opened. With each cycle the mold is filled and spotted over the magazine, the meat is ejected by plungers and deposited on the open package and the mold returned to the filling position. The metal plungers used are coated with plastic and heated electronically to prevent the food from sticking to the mold. The operator removes the box and passes it with succeeding ones down the table where girls place them in cartons or paper bags ready to go into the cooler for shipping. Output is said to range from 1500 to 2000 eight-ounce packages an hour.

This and That

Quaint Water System

Teheran, Iran's capital city of 1¼ million inhabitants, has just put in service its first adequate piped water system. Institution of the improvement prompted a former Iranian correspondent for the *New York Times* to reminisce a bit about the old one—in effect two systems—that will gradually be displaced as the new one is extended.

Drinking water, obtained from *ghanats*—brick-lined tunnels driven into the nearby mountains—is hauled about in yellow horse-drawn tank wagons and sold for about a cent a bucket. Water used for other purposes runs in open conduits or *jubes* that were laid down the sides of the streets in the mid-1930's. The source of supply is a reservoir at the base of the Elburz Mountains to the north of the city. The farther they extend, the more debris and garbage the streams collect, and that has led to a distinct zoning of the population. The richest people live on the north side and get first use of the water.

Every family that can afford it has a garden pool stocked with fish, and each section of the city is allotted a day for drawing water from the *jubes* into the ponds. About 6 P.M. every day the head of water is increased so as to clear the conduits of refuse. Later in the night the *Mir-e-Ab* goes around knocking on doors, shouting to the occupants to open the gates admitting water to their pools.

The new system, financed by Point Four funds from America, cost $15 million and was put in by British contractors. It takes water from the Karaj River 25 miles away and treats it in a $3,000,000 purification plant. When completed, it will have 400 miles of distribution mains.

Novel Packaging Method

Strange as it may seem, a container developed for the Alaskan Air Command uses freezing water to protect perishable foodstuffs from freezing in temperatures as low as minus 65°F. By means of the new method fresh fruits and vegetables can be delivered to far northern outposts undamaged by the intense cold. The container is made up of three sections, according to a report by the Air Matériel Command. The first one, which is much like any other normal package except that it is overwrapped with a water-vapor-barrier material, is encased in a layer of absorbent material about 1 inch thick and saturated with water. Finally the package is placed in a fiberboard box that is likewise protected by a vapor-barrier seal. The container is shipped without regard to cold weather

because it takes at least six hours for minus 65° cold to penetrate to the water-soaked absorbent wrapping and to freeze it solid. Until all the water is solidified, the temperature in the interior of the package will be no lower than 32°F. The 6-hour time margin is enough to insure delivery, it is claimed, because few shipments are ever subjected to such intense cold for a longer period.

* * *

Room For All

Alfred T. Crocker, in charge of Texas Eastern Transmission Corporation's compressor station at Marietta, Pa., has a family of only three (wife and two children), yet he lives in a 23-room house. The building was on the site when the property was purchased and was scheduled to be razed, but it turned out to be cheaper to convert it into a modern home. It was constructed 115 years ago by Henry Fletcher, a local merchant, who lived in it until his death in 1914. The house has two kitchens, one for summer and one for winter, a basement room for making cider, and is finished in cherry, walnut and other luxury woods. Its cost? A mere $5000 in 1840.

* * *

Fine Safety Record

Although mining is commonly considered to be one of the more dangerous occupations, a noteworthy safety record has been compiled by a 102-man crew in the famous Bingham Canyon property of Utah Copper Division of Kennecott Copper Corporation. In five years this group has clocked more than a million man-hours with a few minor mishaps but not a single lost-time accident. The men concerned are members of the mine's water-service department. Their job is to lay and maintain many miles of water, oil, gas and compressed-air pipes. They also install and take care of all pumps. They work with heavy equipment and materials under all sorts of conditions. Their foreman, Joseph Harker, says they have not been lucky — only careful.

* * *

Jet Unit Degasses Tanks

A new type of ventilator for purging tankers of flammable or explosive gases and vapors has been developed in Sweden by Gotaverken, a Gothenburg shipyard. It is portable, can be handled by one man and will not produce sparks. The ventilator, a metal trunk about 5 feet long, is lowered into the tank or compartment to be purged until its upper end is approximately 3 feet below the deck. A nozzle connected with either the ship's steam supply or an air compressor is introduced into the top of the ventilator and serves as a jet to draw in air from the outside. When supplied with 600 kilograms (about 1320 pounds) of steam per hour the device will pull in an estimated 15 tons of air. The combined stream, traveling at around 200 feet per second, rushes to the bottom, divides, swirls and moves up the sides, clearing the space of gas. With the equipment one man can, it is reported, ventilate a cargo tank thoroughly in from 30 to 60 minutes, and two men with two units can degas a 17,000-ton tanker in a working day. The ventilator weighs 75 pounds, is made entirely of nonsparking brass and has no moving parts.

* * *

Gasoline By the Thimbleful

The Process Research Division of Esso Standard Oil Company has a miniature petroleum cracking plant at Bayway, N.J., that produces about 2 gallons of gasoline in twelve hours. It is used for working out new refining processes on a small scale. The division previously operated a pilot plant that turned out three barrels of motor fuel per day. It worked well enough but required the attention of three top-rank technologists seven days a week. It was decided to build a smaller unit, equip it with additional automatic controls and thus permit the three men to spend more time on other worth-while research projects.

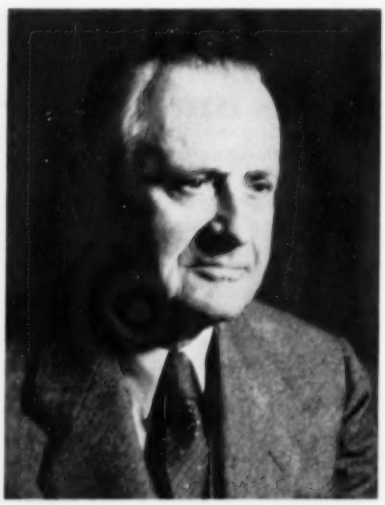
With some exceptions, the laboratory plant is laid out on a scale of 1 to 182 in relation to a full-size commercial catalytic cracking unit. It was necessary, for instance, to make the small unit three stories high in order to get the desired gravity flow. The reactor is 2 inches wide, as compared with 35 feet in a full-scale cracker. A paddle-wheel arrangement circulates the catalyst, a function that is handled by compressed air in commercial units.

* * *

Pneumatic Tubes Aid Banking

The Mercantile Trust Company, of St. Louis, Mo., wanted to establish facilities for serving passing motorists and pedestrians, but there were obstacles in the way. The mother bank is located in the heart of the business district where traffic is too heavy to permit cars to stop at drive-up windows. To make matters worse, the Missouri law prohibits branch banking. The problem was solved by constructing a building two blocks away and linking it with the main bank by means of two pneumatic tubes 1100 feet long. Carrier cylinders can be sent from and received at any one of four windows for motorists and three for pedestrians. Thus the service is rendered from the main bank and is considered under the law as a part of its operations. The tubes run inside a 16-inch galvanized iron pipe laid about 6 feet underground that threads its way through the network of underground utility lines and sewers. The arrangement makes it unnecessary to carry much cash in the new building, thus minimizing the hazard of being held up.

Construction Men Honored by the Moles



HARVEY SLOCUM **HOWARD L. KING**

For outstanding achievement in their field of work, The Moles, New York organization of men engaged in tunneling and heavy construction, presented their 1956 awards to this pair on February 2. Mr. Slocum, nonmember of The Moles, is noted as a builder of concrete dams. Mr. King, vice-president of Mason & Hanger, Inc., of New York, is an authority on compressed-air tunneling.

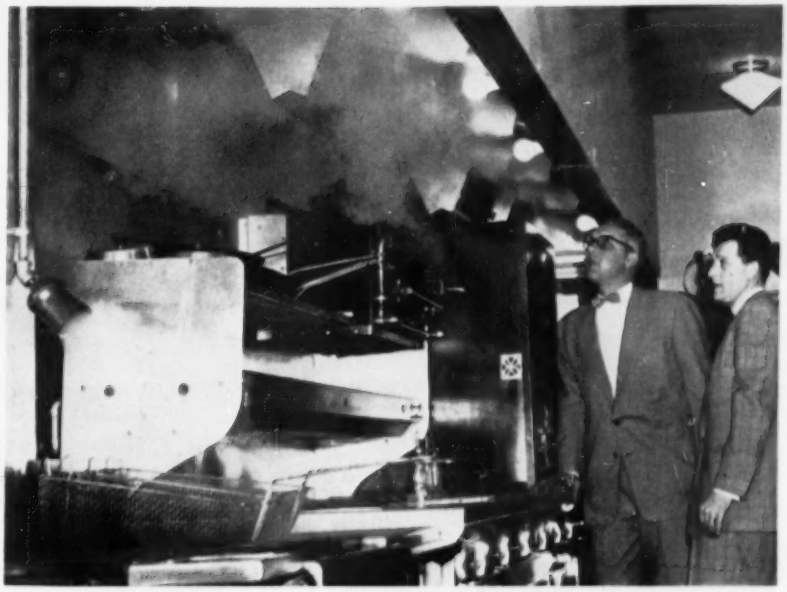
Self-Contained Fire Fighting System

WHAT is said to be an entirely new fire-fighting system for Class B and C hazards—flammable liquids and electrical equipment—has been announced by Walter Kidde & Company, Inc. It operates on a rate-of-temperature-rise principle and uses carbon dioxide under a pressure of 850 psi both as power and extinguishing agent. If a fire occurs, the rapidly rising heat increases the pressure of the air in one or more small heat actuators mounted throughout the danger zone and connected by small-diameter copper tubing to master pneumatic control heads on two carbon-dioxide storage cylinders. The impulse thus received triggers the heads, allowing the gas to enter manifold piping to which other carbon-dioxide cylinders are connected, to open their valves and release the gas. The total charge is then routed through piping to the fire area where it issues from Multijet nozzles and introduces sufficient carbon dioxide into the atmosphere to reduce the oxygen concentration to a point where it will not support combustion and thus smother the flames. Through the medium of pressure-operated valves, switches, trips and other devices, this basic system can be amplified to sound alarms, close vents, dampers and windows, shut down machinery and make one set of cylinders stand guard over a number of danger zones even though each requires a different volume of carbon dioxide.

Big Rock-Pinning Job

ONE of the most extensive rock pinning jobs on record was undertaken by the Atkinson-Ostrander Company on The Dalles Dam Project on the Columbia River. The main navigation lock chamber is 675 feet long and 86 feet wide and has rock walls 130 feet high. To protect excavators on the floor of the lock from falling rock, it was decided before work was far advanced to use No. 11 anchor bars 30 feet long not only to bind the concrete lining to the walls but also to hold the rock in place.

To do the work, the contractor built a scaffold or jumbo 130 feet high, 45 feet long and 25 feet wide. It had four platforms on which wagon drills were mounted and which was pulled along on rails by a tractor. The holes were arranged in a diamond-shaped pattern and spaced on 5-foot centers vertically and 10-foot centers horizontally. The anchor bars project 3½ feet from the rock face, and as soon as they were inserted in a group of holes the latter were filled with neat-cement grout applied at a pressure of about 3 psi. A total of 75 holes was drilled and grouted at one setup.



KITCHEN INSTALLATION

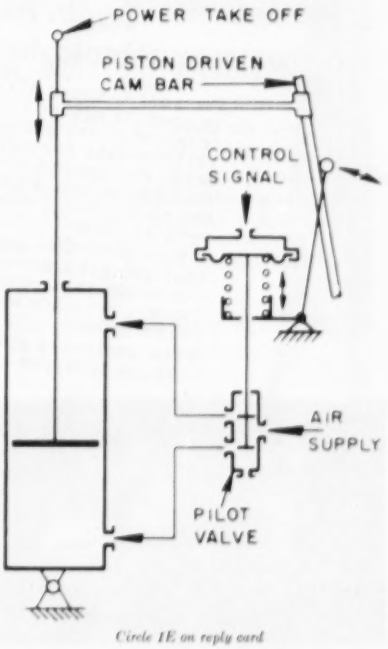
One of the first of the new automatic fire-extinguishing systems was installed in the Town and Country Restaurant in Shaker Heights, Ohio. It is arranged to close dampers and to shut off the exhaust duct ventilating fan and cooking gas. The Multijet nozzles are mounted in the exhaust hood over the ranges and shown discharging the fire-smothering inert gas.

Pneumatic Power Positioners

HAGAN Corporation has announced a complete line of pneumatic power positioners which provide the "muscles" to operate valves, gates or dampeners that control flow, pressure, temperature or level with accuracy, it is claimed, even under severe service conditions. They are built around a double-acting air cylinder and respond to standard pneumatic signals of 3-15, 0-30 and 0-60 psi (other ranges may be ordered). Different models and sizes are available to handle nearly every load to be controlled, and the accompanying schematic diagram of one of them shows how they function.

When a diaphragm valve receives a signal, a 4-way pilot valve is operated, thus admitting air to one or the other side of the cylinder and moving the piston. This, in turn, causes a cam bar to move and to force-neutralize the diaphragm valve through the medium of mechanical linkage. The pilot valve then returns to neutral and the piston comes to a halt. For any given signal the piston will take a definite position and continue to repeat that position within close limits so long as the air signals are of the same strength; that is, for a stroke of, say, 14 inches the piston will stop within 0.14 inch of the spot at which it had come to rest previously.

The positioners are said to respond quickly, the time varying with the length of the stroke. But for the 14-inch unit mentioned it takes only 2.5 seconds for the unloaded piston to travel the full length of the cylinder. Positioning is normally linear with signal pressure, but any desired relationship may be obtained by changing the shape of the cam. The cylinders are designed to use shop air at 100 psi pressure.



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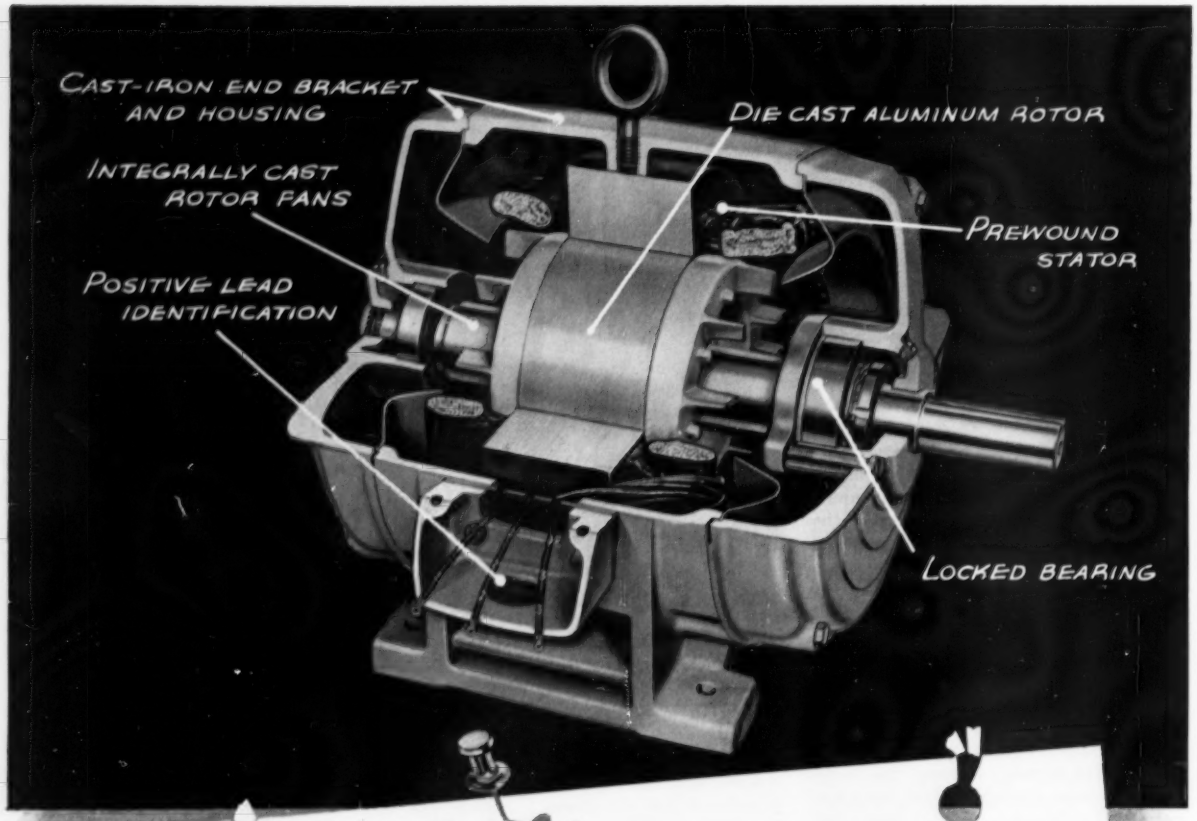


Are you getting all these extras in the motors you buy?

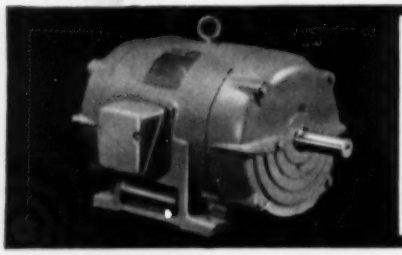
Louis Allis gives them to you, because they build their standard motors with special care

For years, Louis Allis has specialized in special motors for many of industry's toughest drive problems. Such installations call for extreme care in both motor design and manufacture—care that has become a habit with us. That's why we build our standard motors with special care.

What does this mean to you? It means that you get a motor with extra features —a motor that runs better, lasts longer. Here are a few of the extra reasons why:

- New exclusive phenolic impregnating varnish provides high thermal and chemical resistance. It remains resilient and resists aging for longer motor life.
- Locked bearings, inner race to shaft, outer race to end bracket, reduce end play and increase bearing life.
- Increased protection not only for the motor, but also for operating personnel. Double end ventilation permits maximum end bracket enclosure—prevents foreign matter from entering motor.
- Quiet operation obtained by careful design and test. Close manufacturing tolerances assure perfect alignment and minimum electrical noise.

There are many other features such as cast iron construction, positive lead identification, split conduit box—but our new bulletin No. 1700 describes all the many extras you get in a Louis Allis standard motor. Write for your copy.



A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-108

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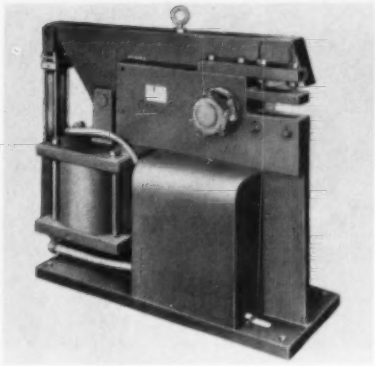
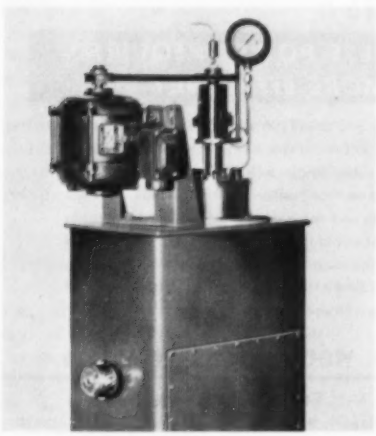
Industrial Notes



For cutting cold ferrous and nonferrous bars and rods in the shop or field, Curry Air Shear Corporation has announced an air-powered machine that is compact and said to be economical to run and maintain. The Type 0-SC-20 is provided with 10-inch knives that have four cutting edges and can be adjusted by setscrews after regrinding. Overloading the equipment does no harm because the limiting factor is the pressure in the cylinder, which uses lubricated and filtered air at from 60 to 125 psi. The shear is designed to handle stock up to 1¾ inches square or round, and at 80 psi pressure will cut maximum-size cold mild steel. It is in operation only during the cutting cycle, which is normally of two seconds duration. The manufacturer recommends the machine for general production work; processing light scrap for baling; cutting concrete reinforcing rods or cables; and for laboratory use.

Circle 2E on reply card

Among the features of a new high-pressure autoclave introduced by High Pressure Equipment Company, Inc., is a water-cooling system the purpose of which is to increase the service life of the packing seal around the stirring drive shaft. In addition, the cooker has a completely enclosed base that permits air purging as a guard against contact of explosive vapors with the heating elements. The motor mounting is accessible for take-up and pulley changes and can be adjusted for agitator pitch and speed. The unit is designed for all kinds of catalytic materials from solids to gases, for pressures ranging from 500 to 30,000 psi and capacities from 1 liter (1.056 quarts) to 20 gallons. It is made of stainless steel, Hastalloy, Monel and other metals and meets A.S.M. code requirements.

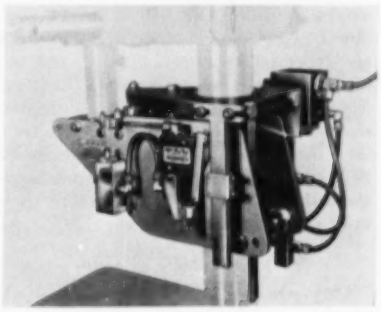


Circle 3E on reply card

Electricians note! Ideal Industries, Inc., claims that its new wire guide makes it possible to slide several conductors smoothly and easily into conduits without skinning wires and knuckles. The guide is a tempered steel spring in the form of a bend and is secured to the conduit by a threaded fitting. It is available in diameters from ½ to 1¼ inches and can be used with all types and sizes of boxes.

Circle 4E on reply card

It has been announced that any standard drill press (cylindrical column 3¼ or 2¾ inches in diameter; spindle 2¼ or 1¾ inches in diameter) can be converted to air-hydraulic feed in a few minutes by an attachment designed by Mead Specialties Company. Power is supplied by a double-acting air cylinder and regulated by a small hydraulic cylinder and hydraulic speed-control valve. The latter is provided with a calibrated gauge to indicate the rate of feed, which ranges from 2 to 60 inches per minute and is adjusted and maintained with precision by an oil-flow check system in place of the usual needle valve. The working cycle is continuous: cams that can be set higher, lower or farther apart trip upper- and lower-limit valves at the top and bottom of the stroke. An adjustable slide and roller on the opposite side regulate the level at which the hy-



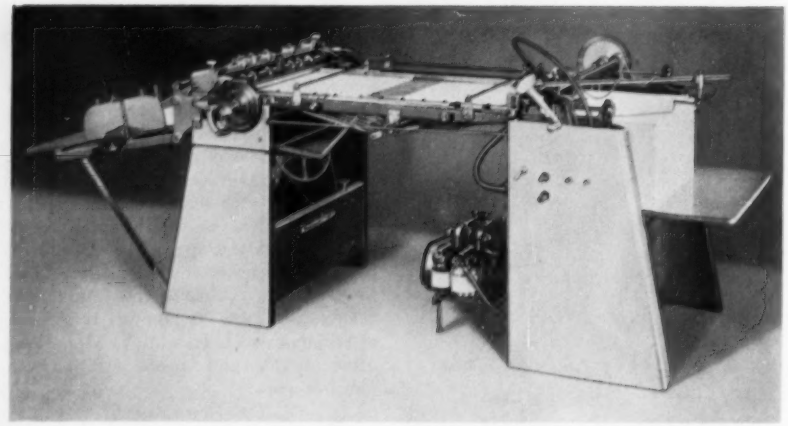
draulic check becomes operative, thus permitting fast approach to any point along the stroke.

Circle 5E on reply card

To its line of filters Wilkerson Corporation has added the Super-Clean, which is designed to remove oil and oil vapors, moisture and solid particles more than three microns in size from compressed air used to operate tools and equipment. For their protection, the device is installed between a moisture separator and the pneumatic tool, and as the air flows through it to a center outlet port, the entrained contaminants are deflected by a top baffle around the filter and into a sump in the bottom, fitted with a drain cock. There are five sizes for air lines ranging from ¼ to 1 inch in diameter. Known as the Series 350, the units are said to absorb large quantities of contaminants before they need replacement.

Circle 6E on reply card

One piece of equipment that takes the place of the two normally used to feed and perforate paper stock in printing plants has been put on the market by the Rosback Company. The dual-purpose machine comes in two sizes for handling sheets up to 30 and 36 inches square and stock from 9-pound manifold to postcard weight. The automatic feed



table, which accommodates a 24-inch pile, has a sensitive elevating mechanism that does not require the usual height counterbalance and needs only one adjustment to compensate for thin or thick paper. Feeding is done by a pressure-vacuum system; that is, one chamber of a double pump provides the blast that separates the front edges of the stacked sheets and the other supplies the vacuum that picks the top sheet off the pile for transfer to the slot perforating unit. Vacuum and pressure controls and start-and-stop switches are located in front of the operator, and a special built-in vacuum valve enables him to change quickly from intermittent to continuous slot or knife-cut perforating, scoring or creasing. A safety disconnect switch stops the feeder if the pile is exhausted while the operator is engaged elsewhere. Speed of production, which depends on the size of the sheet, is said to reach 12,000 per hour.

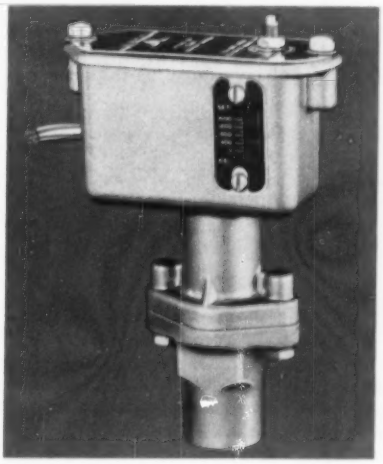
Circle 7E on reply card

For oil-field drilling crews and others who are called upon to cut underground tubing, McCullough Tool Company and Pennsylvania Salt Manufacturing Company have developed a chemical cutter that is said to eat its way through the

walls quickly without damaging the pipe or adjacent casing. The compound, the nature of which has not been divulged, is stored in a pressurized chamber in a cylinder that also contains a firing head. When set off inside a tube, overlapping jets of the chemical are sprayed through perforations in the cylinder against the pipe, severing it completely. The chemical reacts with the metal only where it makes direct contact, and the cut is about the width of a thin pencil mark. The companies report that the tool has operated successfully on several hundred field jobs and will soon be put on the market.

Circle 8E on reply card

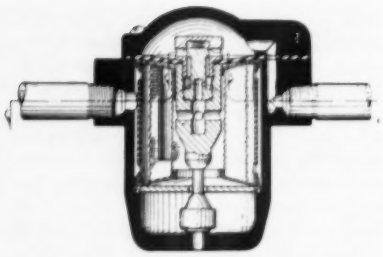
Barksdale Valves is offering a new pressure switch that can be set before or after installation. Listed as C9612, it is provided with a calibrated plate and with a tamperproof needle inside the switch that is visible through a window in the plate. The pointer is lined up with any desired pressure on the plate by means of an external adjustment screw, which is then locked to avoid accidental disturbance. Any system



pressure over an adjustable range of 15 to 3000 psi can be sensed by one of four classes of switches. The piston-type sensing element, according to the manufacturer, is unaffected by jarring or vibration and can be counted on for millions of cycles under fast continuous operation. The switch has a rotating mounting bracket that can be positioned anywhere on a full circle or moved up and down on the neck of the switch.

Circle 9E on reply card

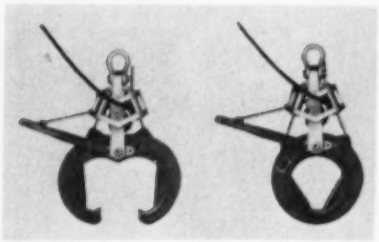
To protect pneumatic tools and equipment from the harmful effects of moisture, sludge and abrasive substances such as rust and scale, Emco Pneumatic Corporation has announced a fully automatic, self-adjusting filter that weighs only 12 ounces. The separator operates on differential pressure. As the air flows



through, entrained moisture and solids with a specific gravity greater than the air collect in the main filter chamber. Sudden stoppage of the air supply causes an internal valve to change position. During this brief interval the foreign fluids and substances collected are ejected through an opening in the bottom of the unit. This cycle is repeated each time the air is released and stopped. The Emco Jet Model L-200A has a capacity of 1-20 cfm and is designed for a pressure range from 60 to 250 psi.

Circle 10E on reply card

Pneumatically operated and electrically controlled, the reinforced lifting hook shown can be opened and closed by push button from the cab of a crane. It is patented by Gar-Bro Manufacturing Company and is especially well suited for heavy-duty work such as



handling concrete buckets on construction jobs. Jaws have a wide spread for easy pickup, and they overlap for safety in closing. It is claimed that the hook cannot open under any load within its capacity. Two sizes are available: a 6-ton and a 12-ton unit.

Circle 11E on reply card

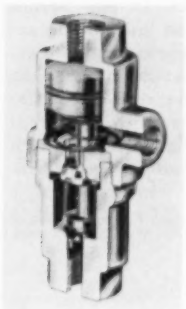
During 1954 about 70,000 tons of liquid sulphur dioxide and 65,000 tons of sulphuric acid were produced from by-product gases released during the oxygen flash smelting of copper concentrate at the Sudbury, Canada, smelter of The International Nickel Company, Ltd.

A new lightweight Fiberglas spherical receiver for storing high-pressure air used to operate pneumatic devices in airplanes has been developed by Walter Kidde & Company. Strands of Fiberglas impregnated with resin are wound around a mandrel made of low-melting-point metal. The mandrel is later melted by steam and removed. One of the new

spheres that will store 650 cubic inches of air at 3000 psi pressure weighs 12¼ pounds, as compared with 20½ pounds for one of wire-bound steel.

Circle 12E on reply card

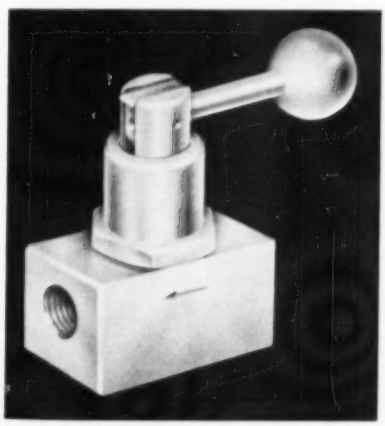
For the removal of water, oil, sludge, carbon and other foreign matter from air tanks of industrial equipment, George



Manufacturing Company has designed an automatic ejector that has no screens, diaphragms, gaskets or washers to cause trouble. Of die-cast aluminum with seats of molded nylon, it weighs only 10 ounces and has but two moving parts. It operates on pressure taken from the governor or unloaded line, unloader pressure opening the valve and reservoir pressure closing it. The ejector is said to be easy to install and maintain.

Circle 13E on reply card

Shown in the accompanying illustration is an addition to James-Pond-Clark's 900 Series of manual shut-off valves. Operated by a fast-acting toggle lever, the unit is designed for pneumatic or hydraulic systems at any pressure from 0 to 3000 psi where immediate tight closure is needed. The leakproof seal is effected by use of a resilient O-ring that is protected from the fluid stream by a floating sleeve. The valve is locked in open or closed position by a detent and held shut by a positively locking toggle-lever cam arrangement. No adjustment is required to compensate for wear. Though of the quick-responding type, shock or water hammer is prevented, it is claimed, because the valve stem crosses a throttling seat and insures gradual starting and stopping of the flow in the system.



Circle 14E on reply card

QUOTES

—FROM HERE AND THERE

No Place Like Home

"Motorists who complain about speeding tickets and other traffic violation penalties here in U. S. never had it so good. You doubt it? In one foreign country, the gendarme lets all the air out of the violator's tires instead of writing a ticket. In Johannesburg, South Africa, drunken driving draws a $2,800 fine, 10 years in jail, or both. In Saudi Arabia, careless driving which leads to a fatal accident can mean the death penalty."

The Co-Operator
LeTourneau-Westinghouse

Concrete Planks Formed by Extrusion Method

"A process now in use in Waukesha, Wis. produces concrete planks like toothpaste being squeezed out of a tube. Recently imported from Germany, the new process makes it possible to extrude up to 4½ lin ft per min of prestressed roof and floor panels. Slabs can be produced in widths of 20 or 40 in. and in thicknesses of 4, 6, or 8 in.

"The method by which the unit, called Spancrete, is produced is ingenious. It is cast in a continuous plank 330 ft long by means of a slip form built into a gantry crane that spans the casting beds. The slip form casting machine can be positioned to place concrete to the desired thickness on any one of six parallel casting lanes. After the six passes, it can repeat the operation casting the second batch on top of the first.

"As the concrete plank is formed, the casting machine automatically shapes out tongue and groove edges, vibrates and tamps the material, accurately positions the pretensioned wires at the required distance from the bottom of the slab, and finally screeds and trowels the top surface. Since a no-slump concrete is used, there is no need for fixed side forms.

"The Boss says yer demoted . . . Here!"

Dimensional accuracy attained is plus or minus 1/16 in.

"Dead weight of the panels is kept to a minimum by using hollow-core construction and a lightweight concrete mix in those portions of the cross section adjacent to the cores. A 6-in.-thick slab weighs 45 psf."

Engineering News-Record
November 24, 1955

BRIEFS

Although the United States is known as the home of big business organizations, records show that 95 percent of all the nation's concerns employ fewer than twenty persons. Only one percent has more than 100 on the payroll.

•

The Davis Construction Corporation recently agreed to excavate 50,000 cubic yards of earth on Long Island, N. Y., for one cent. Another contractor offered to do the job for 98 cents and a third asked just $1. The reason for the low bids was that earth fill, which is scarce in the area, was needed by the bidders for use on other jobs they had underway.

•

The American Can Company states that one out of every six cans now produced in the country is a beer container. Twenty years ago nothing but glass was used for this purpose. The demand for cans for motor oil, coffee, shortening and pet food is also increasing sharply.

•

Goodyear Tire & Rubber Company reported just before the year's end that it had produced its 675 millionth pneumatic tire. Twenty-five million were made in the final eight months of 1955. It took the firm seventeen years to turn out its first 25 million tires.

•

One of the world's largest lathes has been installed by General Electric Company in its Schenectady works for use in building big equipment. It has a 144-inch swing, is 55 feet long between centers and cost close to $500,000.

•

A blast of record size for Canada was fired in December at the Helen open-pit iron-ore mine of Algoma Ore Properties, Ltd., in Ontario. Approximately 1.2 million tons of ore was brought down by detonating 150 tons of powder.

•

One automobile air-conditioning unit, including the compressor, is no larger than a football but has a cooling capacity equal to that of approximately 24 household refrigerators.

•

Spiegel, Inc., a Chicago mail-order house, now ships tropical fish by mail. They are placed in water in a plastic bag which is enclosed in an insulated carton approved by the Post Office De-

partment. Compressed oxygen is introduced into the bag through a hose and nozzle just before the fish start their unusual journey.

•

A white-topped automobile parked in the summer sun will remain 15°F cooler inside than one with a black top, according to automotive engineers.

•

Canada has appointed a committee to investigate the possibility of piping water from the Great Lakes to cities and farming areas where the supply is short.

•

The Detroit-Windsor Tunnel between the United States and Canada is the first international vehicular bore and the Ambassador Bridge is the longest international bridge. The mile-long tube dips 80 feet under the surface of the Detroit River and can handle 1000 cars an hour.

•

When Associated Pipe Line Contractors, of Houston, Tex., sent a crew to Turkey to lay a pipe line it made sure the group would be comfortable. On the same ship with the 40 Texans were eleven houses on skids, all completely furnished. Six house trailers also were taken along.

•

To save time in razing the old 8-story United States Hotel in Boston, Mass., a 6800-pound bulldozer was hoisted to the roof to tear it down. It was elevated without incident by an American truck-mounted crane.

•

The Ohio Highway Department believes in preparedness. Rather than run the risk of having snow removal equipment fail when it is badly needed, all 1200 pieces used in the 88 counties were given a "dry-run" inspection in October. Each was tested for operating condition and safety.

•

Certain plastic articles have an odor that is objectionable to some people. Aware of this, research chemists working on new plastic compounds always check to see how they will smell when made into consumer products. One of the surest and simplest tests is to place some ordinary soda crackers near the material for a short time. If the plastic gives off the slightest odor, the taste of the crackers will indicate it.

•

The Detroit plant of Square D Company, manufacturer of electrical equipment, has a pneumatic tube system 2000 feet long that transports 56,000 carriers a month between various departments. Up and down stairs, around corners, between buildings the "paperwork" travels at a speed of about 30 feet per second. Orders are delivered from the scheduling department on the fifth floor to one of the shipping departments on the first floor in sixteen seconds. On foot the same trip takes five minutes or longer.

Books and Industrial Literature

A new series of Unitary mechanical seals designed for use on process pumps has been announced by The Garlock Packing Company and is discussed in Bulletin AD-151 containing sectional drawings and diagrams.

Circle 15E on reply card

A 12-page catalogue on heavy-duty air cylinders has been released by Petch Manufacturing Company. Designed according to JIC standards, they feature interchangeable mounts and are well adapted for automation.

Circle 16E on reply card

Mercury Piping Company, which serves a broad industrial market ranging from small pneumatic-control panel systems to large hydraulic presses, shows in a pictorial brochure how it plans, fabricates and erects low- and high-pressure piping.

Circle 17E on reply card

Asbestos Safety Clothing is the title of a 12-page booklet that also covers Johns-Manville's safety curtains for auditoriums, theaters, TV studios, etc., as well as fire-smothering blankets used by fire trucks, safety patrols and commercial truckers.

Circle 18E on reply card

Adamas Carbide Corporation has recently published a pocket-size guide that is designed to help the carbide user select the proper grade for his requirements. Included is a decimal equivalents table and a diagram showing the relation of feed to speed.

Circle 19E on reply card

A 20-page catalogue, No. 215-B, on flexible ball joints has been prepared by Barco Manufacturing Company, maker of different types of movable joints for use in pipe lines for power, process, heating, chemical, construction and hydraulic services. Design and operating engineers should find the section on piping problems such as expansion and contraction, alignment and slow rotation of interest.

Circle 20E on reply card

A 24-page catalogue on Dy-Namic balancing in industry has recently been published by Bear Manufacturing Company. With tables, diagrams and application pictures it answers such questions as how to balance rotating parts weighing from 4 ounces to 8 tons; what is Dy-Namic un-

"What wise guy bid three no trump?"

balance; how to balance rotating parts statically and Dy-Namically in one operation; why static balancing alone often does more harm than good; and how Dy-Namic balancing reduces bearing wear, eliminates noise and vibration.

Circle 21E on reply card

The Ramtite Company, Division of The S. Obermayer Company, recently issued a 16-page catalogue describing its plastic and castable refractories, cements and mortars from packaging to completed installations. Typical applications and suggestions on how to use the products are included.

Circle 22E on reply card

A new technical manual which fully describes the manufacture of Microflat black-granite surface plates and precision inspection accessories is now available from Collins Microflat Company. Of 67 illustrated pages, it contains a section devoted to geological sources and quarry operations.

Circle 23E on reply card

A data sheet on Multi-V belts featuring the patented Grommet construction exclusive with The B.F. Goodrich Company has been published by its Industrial Products Division and is available without charge. Included is a chart showing standard- and high-capacity V-belt numbers, sizes and pitch lengths.

Circle 24E on reply card

A 32-page catalogue recently released by Plibrico Company covers its entire range of products for the industrial-furnace field. In addition to describing its refractories and illustrating typical applications, the book contains a chart that enables the user to choose the material which is best suited for a given purpose.

Circle 25E on reply card

Information on adhesives, coatings and sealers for the railroad industry is contained in an 8-page illustrated catalogue obtainable from the Adhesives & Coatings Division of Minnesota Mining & Manufacturing Company. Typical uses of eleven different types are listed and methods of application are described and illustrated.

Circle 26E on reply card

A recent bulletin released by Illinois Testing Laboratories, Inc., introduces the reader to the multiplicity of instruments for general industry that are manufactured by Alnor. In it is a brief description of the salient features of each instrument and the number of the bulletin which gives complete engineering data about it.

Circle 27E on reply card

Buildings by Luria is the title of a 28-page illustrated catalogue which describes Luria Engineering Company's standardized steel structures for industry and government and hangars and other airport buildings. Requests for copies should be addressed on company stationery to Bethlehem, Pa., or to the main office at 511 Fifth Avenue, New York 17, N.Y.

A revised booklet obtainable from Acheson Colloids Company gives information about 42 colloidal and semicolloidal dispersions for industrial applications, together with their carriers and diluents. New on the list is No. 224, a mica-and-water product for use as a metalworking lubricant and as a dielectric coating.

Circle 28E on reply card

Magnus Chemical Company, Inc., has available a copiously illustrated 31-page bulletin entitled *How to Select the Proper Method, Machine and Material* for cleaning, degreasing, decarbonizing, bonderizing, dry-

ing, blackening and otherwise processing metal parts. Features and applications of more than 100 types of equipment are discussed in this general guide, which may be supplemented by recommendations from the firm's engineering departments.

Circle 29E on reply card

A bulletin on the recently developed Pushbutton Anemotherm—a self-contained, portable unit for measuring air velocity, air temperature and static pressure in heating, ventilating and air-conditioning systems—has been announced by the Anemostat Corporation of America. Operation of the instrument is explained and various types of systems are discussed.

Circle 30E on reply card

A 32-page illustrated catalogue describing General Electric Company's complete line of control transformers is available upon request. Designated as GED-2767, it contains ratings, dimensions, product features and wiring diagrams. A special section shows panel and machine-tool voltage regulation curves for use in selecting the proper transformer for a given application.

Circle 31E on reply card

A special service to metallurgical industries—the production and processing of made-to-order metals in experimental quantities—performed by Allied Products Division, Hamilton Watch Company, is dealt with in an illustrated 16-page booklet entitled *Precision Metals Services*. Among other information, it describes the firm's pilot plant for producing small (10-pound) ingots by regular or vacuum melting and for forging, annealing, heat treating, rolling and drawing the resultant metal.

Circle 32E on reply card

The 1955 edition of *Motor Truck Facts* published by Automobile Manufacturers Association contains some 50 pages of charts and tables and covers commercial-vehicle factory sales and production, mileage, commodities shipped by truck, taxes, employment and other pertinent subjects. A table on registration from 1904 to date shows that last year the number of trucks in the nation exceeded 10,000,000 for the first time in history. It is interesting to observe that truck and bus transportation now provides jobs for 6,725,000 Americans, or for one out of every ten persons employed in the nation.

Circle 33E on reply card

"I don't mean to be unkind, Miss Nelson, but isn't it about time you got a new permanent?"

NOW..
GREATER THAN EVER
PROTECTION TO YOUR AIR LINE
with the outstanding

M·B

WHIRL-A-WAY FILTER, REGULATOR AND LUBRICATOR ASSEMBLY and AUTOMATIC AIR TRAP

MODEL W-4

AIR TRAP

EJECTS WATER AUTOMATICALLY AND RAPIDLY

The FILTER removes solids .00039 and larger. Transparent bowl provides visibility. The REGULATOR can pass large volume with an unrestricted flow and minimum pressure drop. Self-bleeding, compact. Machined from bar aluminum.

The LUBRICATOR delivers desired volume of oil. Bowl can be refilled without shutting off air supply.

The AIR TRAP is an Automatic Water Ejector for all air line applications. Assures dry air in pneumatic systems at all times. Eliminates costly downtime and assures preventive maintenance. WRITE FOR LITERATURE.

Visit our Booth 557 A. S. T. E. Ind. Exp., Chicago
March 19 - 23

M·B PRODUCTS
46 VICTOR AVE., Div. 14
DETROIT 3, MICHIGAN

Circle 30A on reply card

Use One Hose for Many Jobs!

GOODALL "ALLSERV"
General Purpose HOSE

"ALLSERV" will not only give long, reliable service on air and pneumatic tools, but will prove equally efficient in the handling of water, oil, gasoline and chemicals, and for paint and insecticide spraying, grease guns, etc. The adaptability of this one hose to such a wide variety of applications provides a sure way to keep hose inventory **low.**

"ALLSERV" is a very flexible all—"Synplastic" (R) molded-and-braided hose, in one, two or three braid construction, with a tough wear-resistant red cover. Sizes ¼" to 1½", for working pressures from 200 lbs. to 300 lbs.

Contact our nearest branch for complete information.

"If it's GOODALL, it MUST be Good!"

Standard of Quality—Since 1870

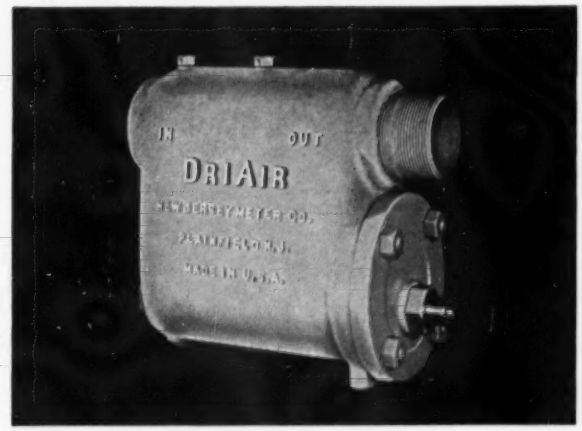
HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Branches and Distributors Throughout the United States and in Canada

Circle 31A on reply card

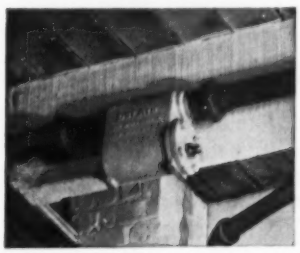
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

Circle 32A on reply card

ARMSTRONG *Snap-Action* AIR TRAPS

Assure Wide Open—Tight Shut Operation

TRAP CLOSED

TRAP OPEN

Positive action, no dribbling, no hunting, no air loss—these are the advantages of the Armstrong "snap-action" ball float trap with spring-powered valve. The trap opens wide with a snap. *Before* all water leaves trap, valve snaps tightly closed. The valve is always water-sealed, preventing air loss. Fine dirt and grit won't interfere with operation.

The flat strip spring of special Swedish steel lasts for years in ordinary service. Valve and seat are hardened chrome steel. All other internal parts are stainless steel.

Where heavy oil is encountered in lines, use inverted bucket traps. Ask for Bulletin 2022, describing both types. Call your local Armstrong Representative, or write

No. 71-315 is a forged steel trap having the same mechanism as the No. 71, but is designed for pressures up to 1000 psi.

ARMSTRONG MACHINE WORKS
885 Maple St., Three Rivers, Mich.

ARMSTRONG *Snap-Action* AIR TRAPS

Circle 33A on reply card

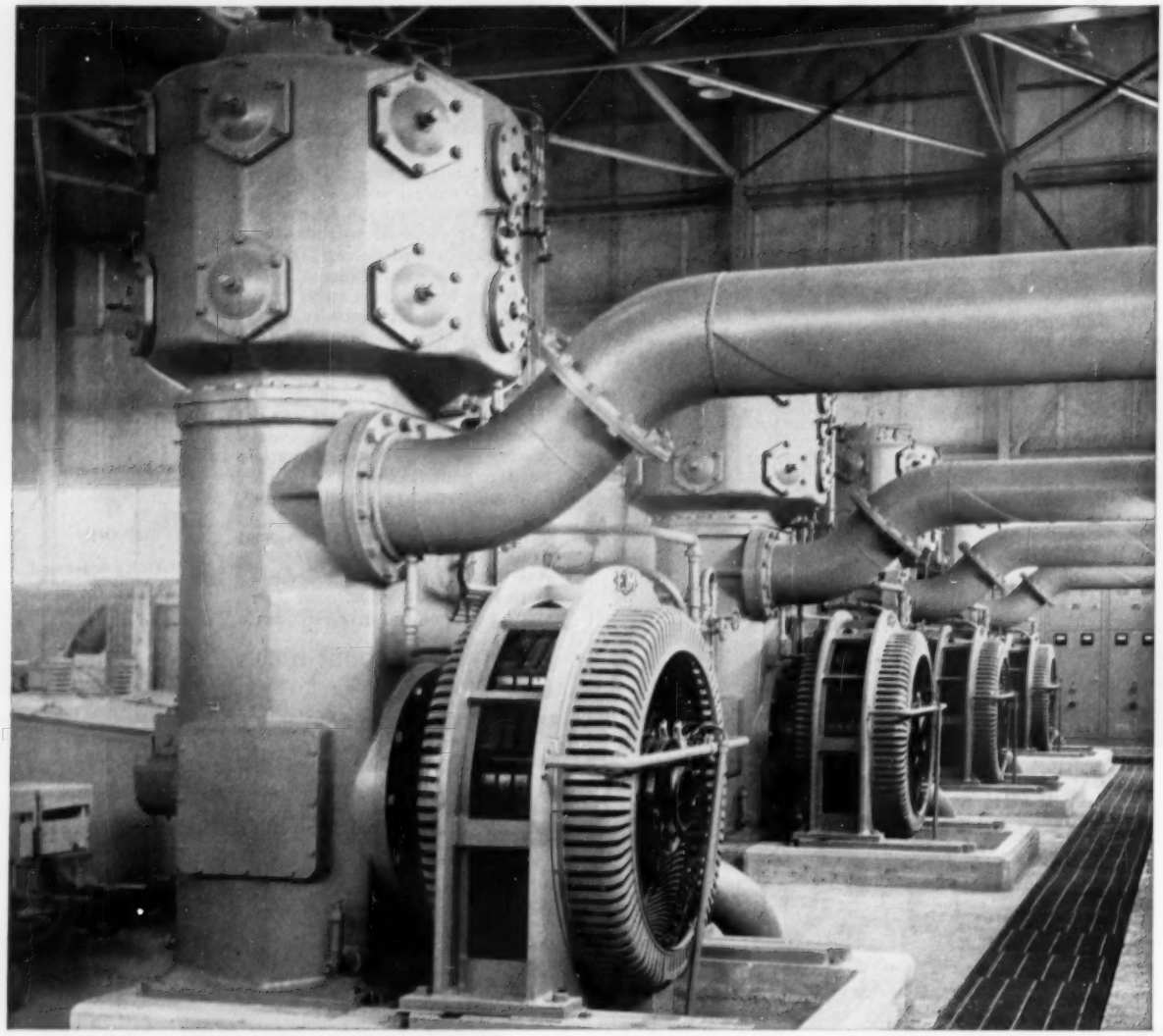
BUY BOTH BOOKS FOR $5.00

Price Individual Books		Per Copy
Compressed Air Data	(Fifth Edition)	$3.00
Cameron Hydraulic Data	(Twelfth Edition)	3.00

COMPRESSED AIR MAGAZINE, 942 Morris Street, Phillipsburg, New Jersey.
Please send me:

- ☐ Compressed Air Data and Cameron Hydraulic Data..Both books for $5.00.
- ☐ Compressed Air Data $3.00
- ☐ Cameron Hydraulic Data $3.00
- ☐ Enclosed is (money order) (check) for $.....) ☐ Send books C.O.D. I understand that the books will be sent me postpaid, and that they may be returned within 10 days if not satisfactory.

Name .....
Company .....
Street No. .....
City .....State .....Country .....



Start---Stop...Start---Stop...Start---Stop

● That's the way it is for these electric motor-driven compressors supplying air for underground mine use at The New Jersey Zinc Company Sterling Mine, Ogdensburg, New Jersey. Four 350 hp, 1.0 power factor, 450 rpm E-M Engine-Type Synchronous Motors, shown above, drive four two-stage air compressors which supply air for tools and other mine operations.

Since the air driven equipment in use at any given time may vary widely, the compressors are called on to operate at any of sixteen steps of loading and unloading, as selected by a specially designed sequence control panel. This means repeated starts and stops day after day, putting unusual stress on the motor windings.

E-M engineers designed these motors for rugged starting duty. The stator coils are wound and lashed with extra strength and the starting cage windings have high capacity to withstand heavy repeated starting stresses.

And here's why these E-M Motors provide a most economical, reliable, trouble-free drive for the compressors:

1. **High Efficiency,** utilizing electric power most sparingly.
2. **Power Factor Correction,** reducing power costs.
3. **Direct Connection,** simplifying installation.
4. **Simple Starting** with "CONSCIOUS" CONTROL, through E-M "Hi-Fuse" Control with Polarized Field-Frequency System.

For specific information on how E-M Synchronous Motors can help you get top performance from large compressors, get in touch with your nearest E-M sales engineer. Write for E-M Synchronizer No. 32 on air compressor drives.

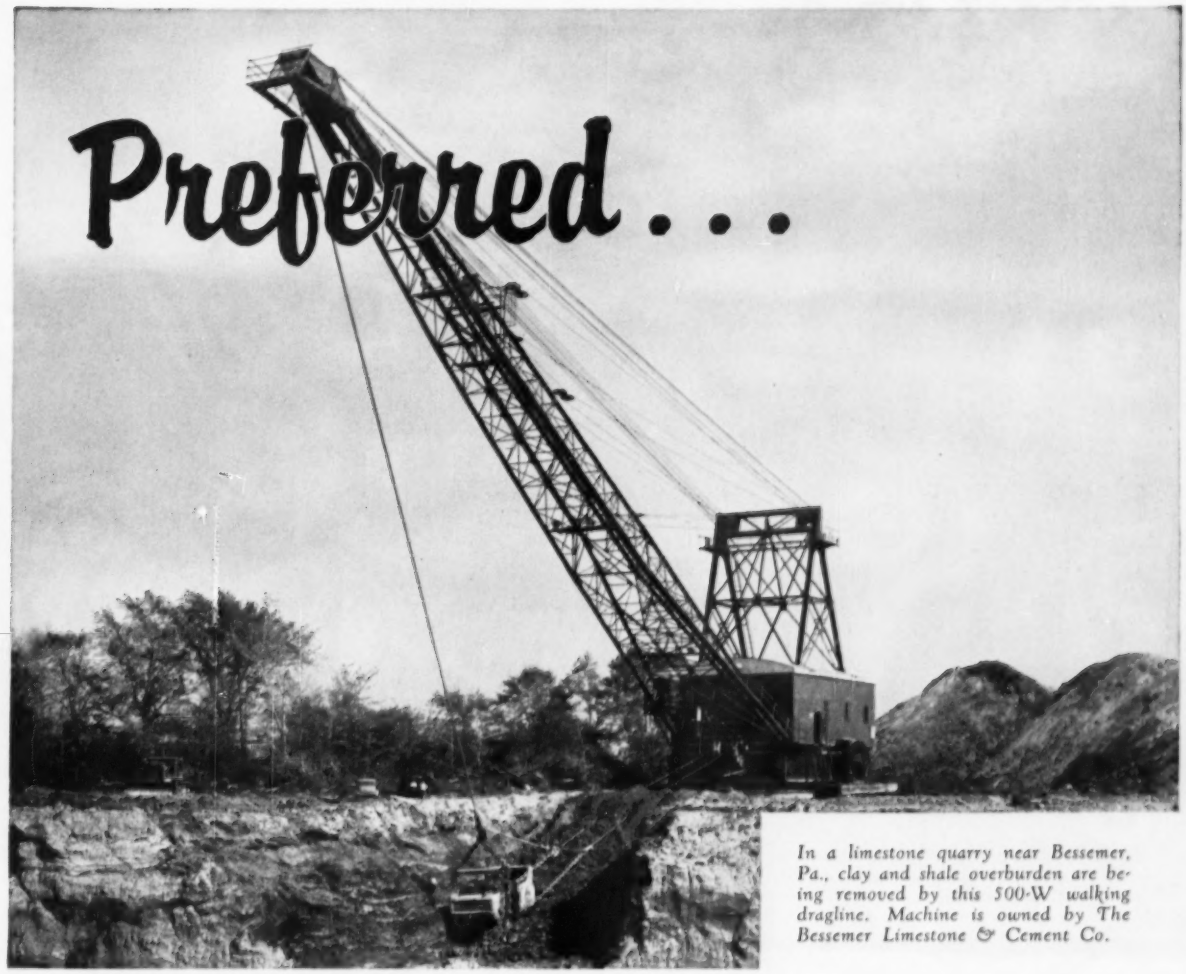
ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

E-M

1200-TPA-2161

***Specialists in making motors do* EXACTLY WHAT YOU WANT THEM TO**

Circle 34A on reply card



In a limestone quarry near Bessemer, Pa., clay and shale overburden are being removed by this 500-W walking dragline. Machine is owned by The Bessemer Limestone & Cement Co.

FOR ECONOMICAL, BIG-VOLUME STRIPPING

Range, capacity, strength, and speed — these four features have helped build customer preference for Bucyrus-Erie walking draglines through the years. In combination, they have enabled machines like this 500-W "walker" to deliver consistent, economical output in moving millions of yards of overburden, whether in iron mines or phosphate fields, in open pit coal mines, or in bauxite. The number of Bucyrus-Erie stripping draglines in successful operation today is a measure of their ability to provide long and profitable service.

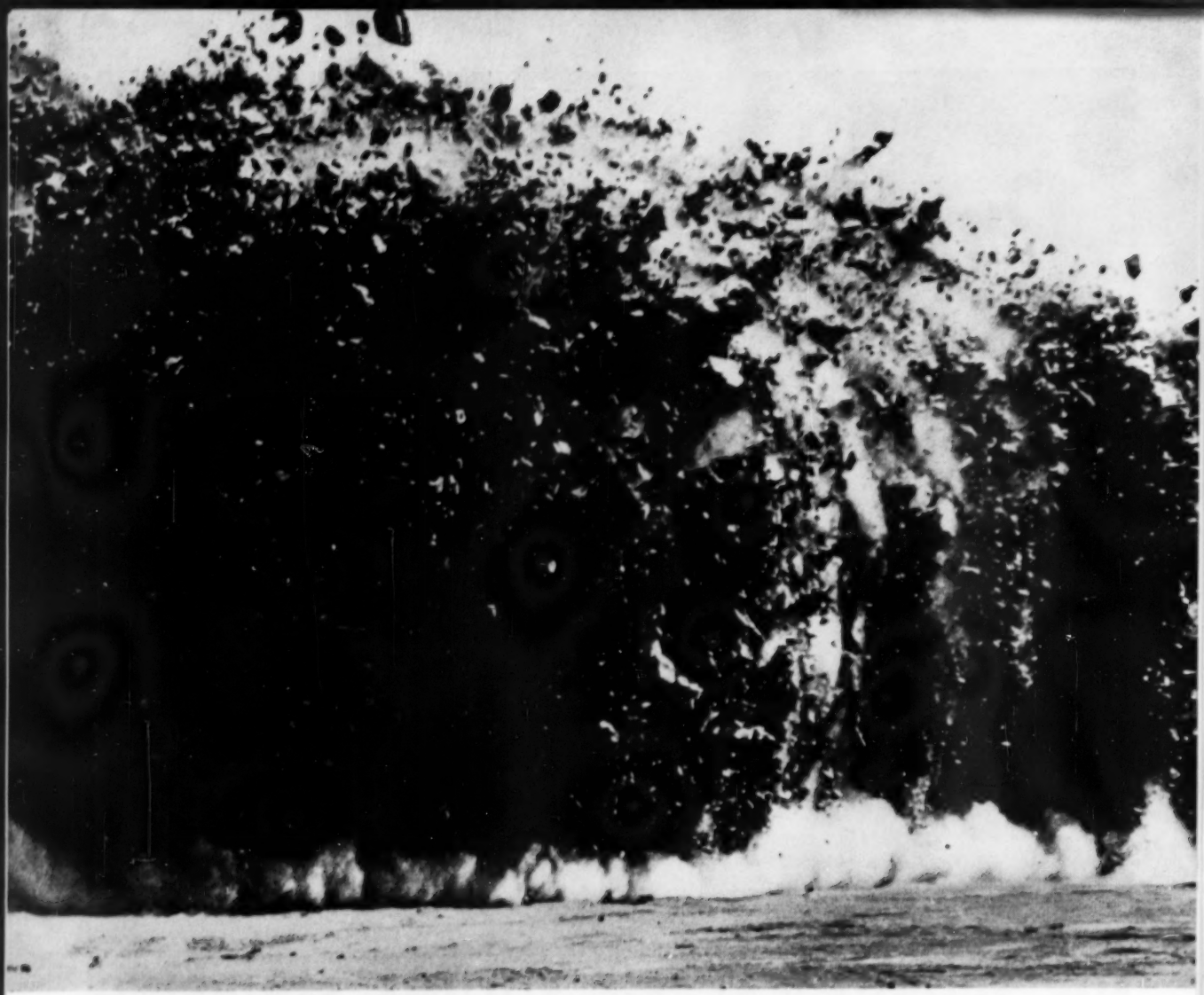
Offering the largest selection of sizes of any "walker" manufacturer — ten models ranging from the 4-yd. 180-W to the 30-yd. 1250-B — Bucyrus-Erie is prepared to furnish you with the machine to fit your earth-moving needs. Write for a full description and complete specifications on the size of machine you need.

62L55

BUCYRUS ERIE
South Milwaukee
Wisconsin

75 YEARS OF SERVICE to Men Who Shape the Earth

Circle 35A on reply card



EXPLOSIVES RESEARCH IN ACTION

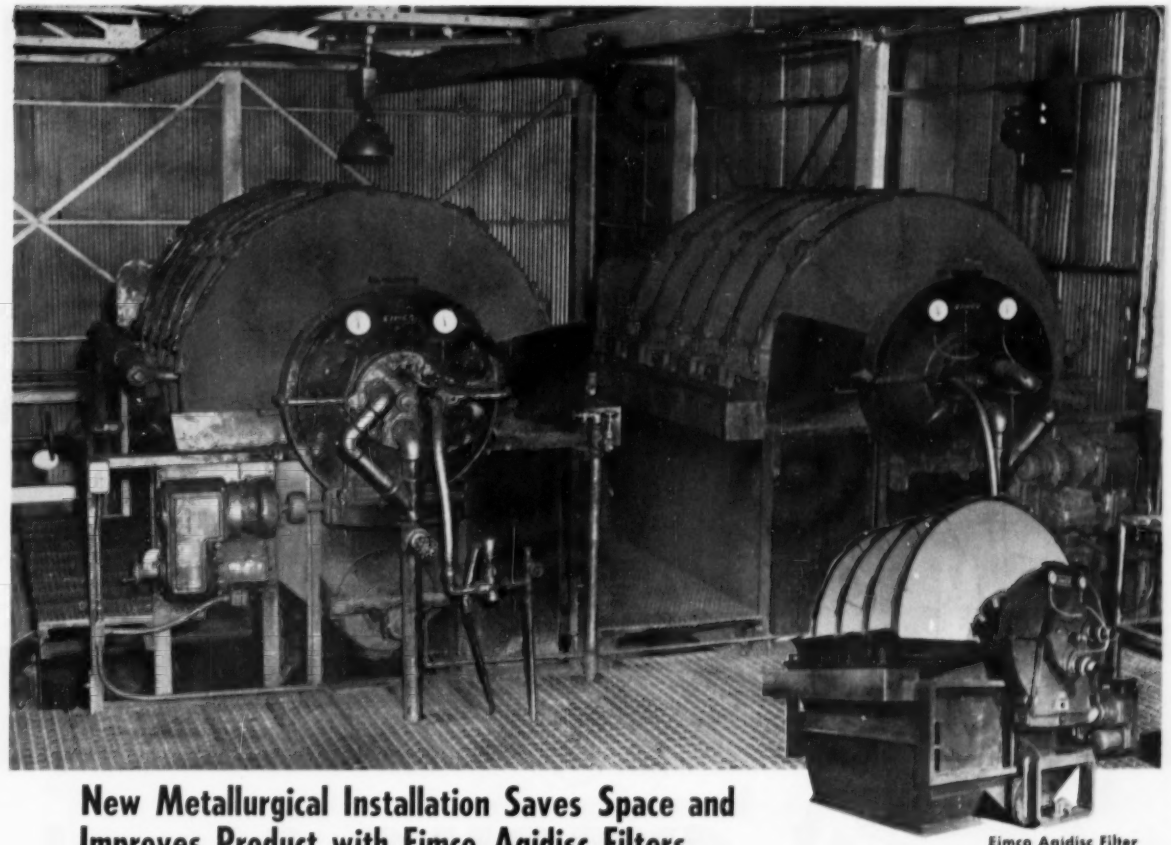
This photograph of a blast of 27,000 pounds of Hercules® explosives in a traprock quarry is conclusive proof of how proper explosives technique pays off. The initial breakage was excellent, providing a sloping bank of broken rock for easy shovel digging and uninterrupted crushing and screening operations in the plant.

Achieving satisfactory results from primary blasts requires the selection and use of the right explosives materials and methods. For more than 40 years, Hercules has pioneered in the development of improved explosives techniques for quarrying, mining, seismic prospecting, and construction. A Hercules representative will welcome the opportunity to assist in solving your blasting problems.

HERCULES POWDER COMPANY

Explosives Department, 932 King St., Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.



Eimco Agidisc Filter

New Metallurgical Installation Saves Space and Improves Product with Eimco Agidisc Filters

The photo above shows an installation of two 6' diameter by 5 disc Eimco Agidisc Filters in their operating position in a new metallurgical concentrating plant.

These filters were installed as a result of the owner company and Eimco cooperation in a joint effort to improve the operation of the filter station at this plant and reduce moistures with the most economical equipment.

After the installation had been operating for six months the following data was made available.

		PREVIOUS EQUIPMENT	NEW EIMCO FILTERS
1.	Concentrate handled	350,000 lbs./24 hrs.	350,000 lbs./24 hrs.
2.	Labor required	1 man full time	1 man part time
3.	Attention required	Constant inspection	Periodical inspection every 6-8 hrs.
4.	Operating Capacity	Full load—no capacity for additional tonnage	½-¾ load—capacity for 33% to 100% additional tonnage
5.	Equipment	4—Drum filters (not Eimco)	2—6' dia. x 5 disc Eimco Agidiscs
6.	Filter area	621 sq. ft.	500 sq. ft.
7.	Floor Space occupied	416 sq. ft. filters only	189 sq. ft. filters only
8.	Cake Moisture	20%—21%	14%—15%
9.	% Moisture reduction over previous method		33%
10.	Filter rate increase over previous method		more than 15%

Eimco specializes in equipment to do a better job in filtration. Before you buy, take advantage of Eimco's experience in building filtration equipment for customers who look beyond first cost to get quality construction, individual design and guaranteed performance.

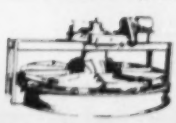
THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Pasadena, Calif. Houston, Texas London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-102

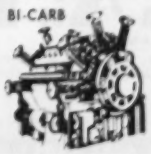
PAN



CONTINUOUS PRESSURE

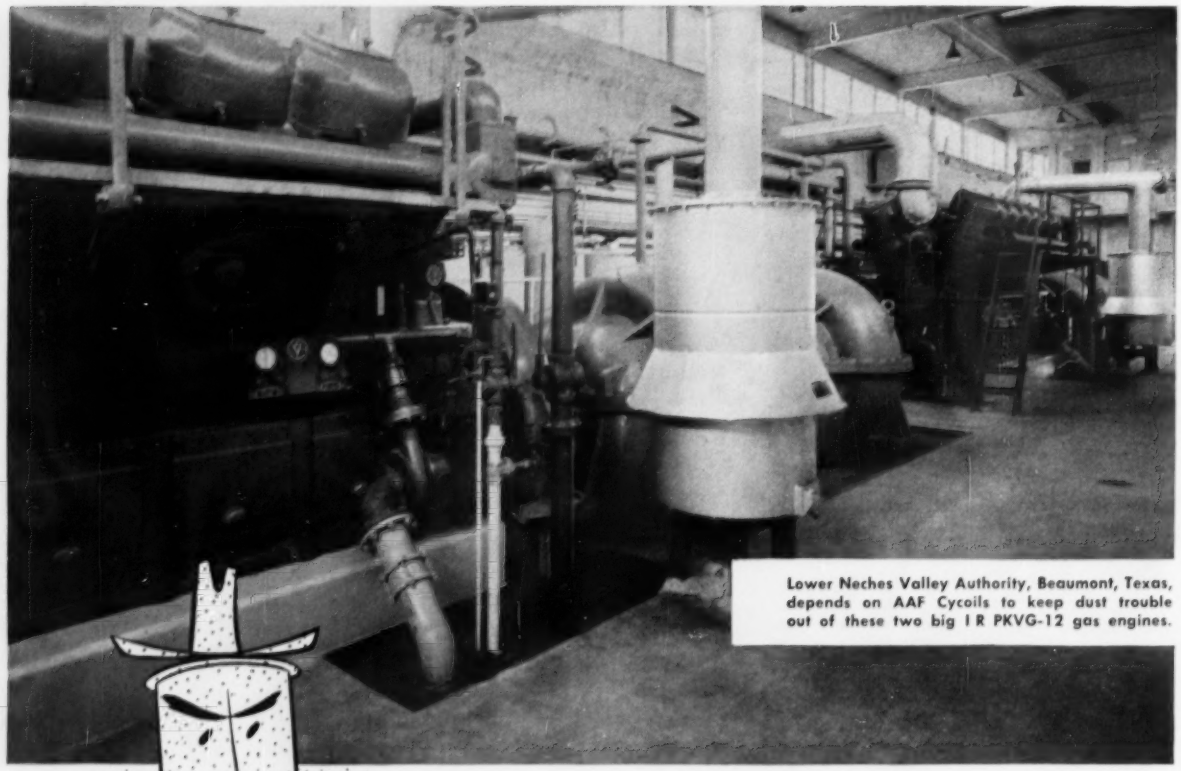
PRESSURE PRECOAT

BI-CARB

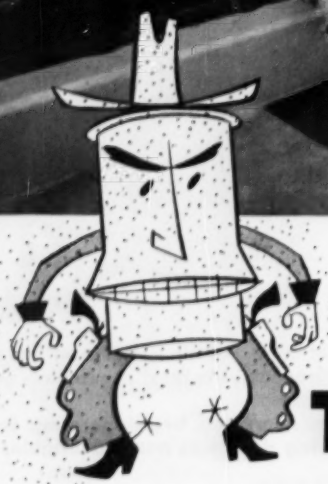


PRESSURE ROLL

BURWELL



Lower Neches Valley Authority, Beaumont, Texas, depends on AAF Cycoils to keep dust trouble out of these two big I R PKVG-12 gas engines.



CYCOILS Corral Tough Texas Dust

THESE two gas engines each drive two pumps in tandem, with capacity of 110,000 gpm per unit, for the Lower Neches Valley Authority, Beaumont, Texas. It's a big job. There's no time for down-time.

That's why you see those AAF Cycoil heavy-duty oil bath air cleaners on the job. They provide 4-way cleaning—impingement, scrubbing, cyclonic action and filtering. Over 90% of the fine dust content in the air is trapped in oil and removed by centrifugal action before most of it even reaches the filter pads! Additional action of filtering pads, what's more, plus positive oil circulation for self-cleaning action, provides air that's virtually 100% *dust-free.*

Only Cycoil gives engines and compressors this kind of protection. Write for Bulletin No. 130 . . . the nuts-and-bolts, facts-and-figures story on Cycoil Oil Bath Air Filter!

American Air Filter
COMPANY, INC.
402 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS Multi-Duty Filters

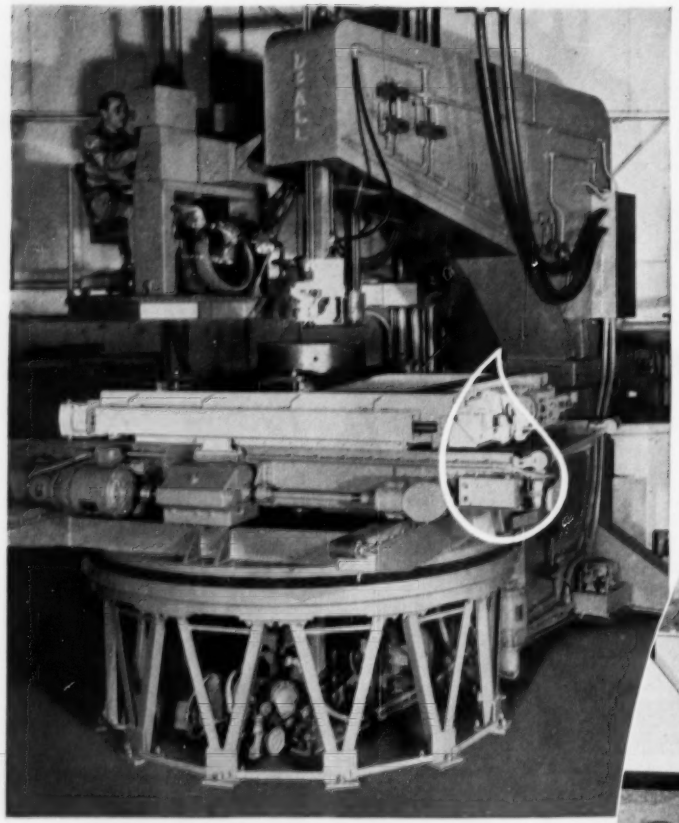
Type G Pipeline Air Filters

BETTER AIR IS OUR BUSINESS

Type OCH Intake Air Filters

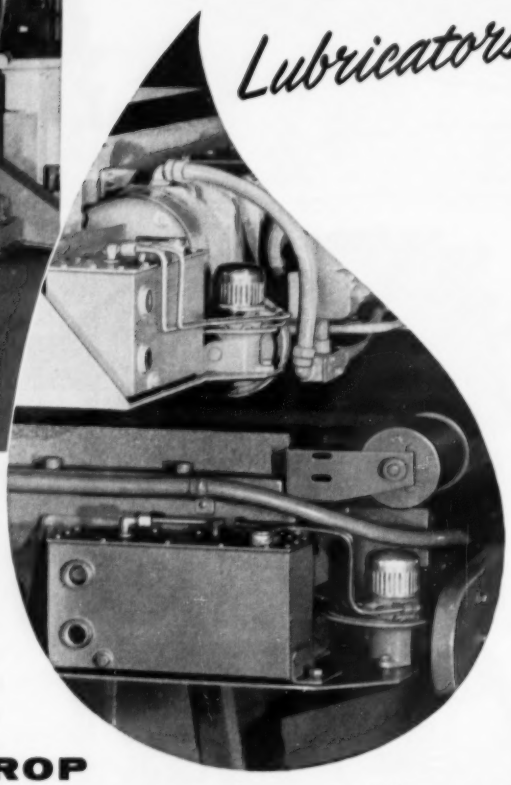
Cycoil Oil Bath Air Filters

Circle 38A on reply card



MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED

...MADISON-KIPP *Lubricators*



Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois...Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

Fresh Oil...

BY THE MEASURED DROP

...from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

kipp

MADISON-KIPP CORPORATION
202 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• **Skilled in Die Casting Mechanics** • **Experienced in Lubrication Engineering** • **Originators of Really High Speed Air Tools**

how to get the most out of HOLLOW DRILL RODS

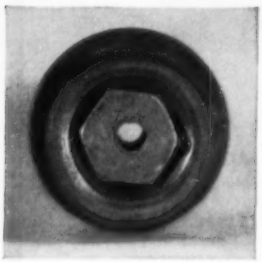
Modern drill rods – especially new *alloy* hollow drill rods like Crucible CA DOUBLE DIAMOND or 4E – give longer drill life than was possible with straight carbon rods. They'll give you lower cost per foot of hole drilled on the job. They will, that is, if you let them. For *abuse* will stop even the best steel from doing its best job. And you pay the price in higher drilling costs.

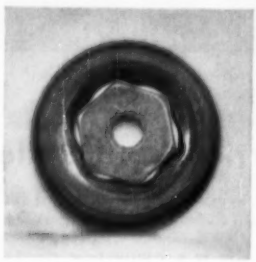
Rods properly racked and stored give better service.

Take, for example, MAINTENANCE:

DRILLS — Pneumatic drills are often so badly in need of repair that good drilling is impossible. Early failure of any rod used in these drills is inevitable. The solution is regular, periodic inspection of all drills and equipment – replacement of worn or damaged parts.

The damaged and worn striking faces of these pistons prevent impact from being transmitted to the rod in a straight line. Rod failure results.





BITS — Keep bits sharp. A dull bit binds in the hole, and drills so slowly that little useful work is performed. But the drill steel must absorb the rugged blows of the hammer.

Proper bit maintenance pays off.

RODS — It's a temptation to store drills by throwing them into one big pile. Resist it. For nicks and surface damage result – drill failures occur at points of damage.

It pays big dividends to make good maintenance a habit. Quality drill steels, like Crucible CA DOUBLE DIAMOND or 4E Alloy Hollow Drill Rods, are made to give long service, lowest cost per foot of hole drilled. They're tough, strong, made to tool steel standards. This *extra* quality assures you of minimum rod breakage, fewer valuable bit losses. But to bring out the best in 'em, you've got to do your part by keeping equipment in shape.

Crucible hollow drill rods are always quickly available in the sizes and types you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

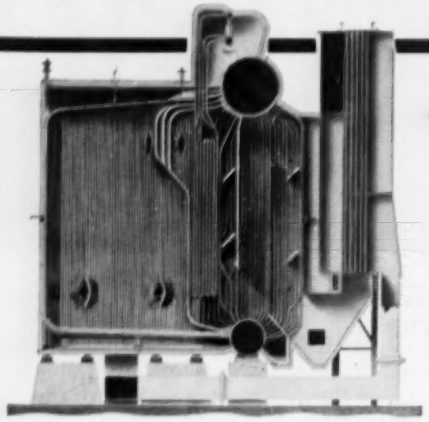
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

one of these C-E standard boilers is . . . .
DESIGNED FOR YOUR PLANT

If your steam needs range between 4,000 and 120,000 pounds per hour, one of these versatile C-E Boilers will give you economical, standout performance. For while they are standard in design (which means lower first cost and proven performance), they're still *flexible* enough to be easily adapted to meet almost any standard requirement.

Chances are that one of the C-E standard boilers is the answer to your steam needs. But whatever they may be, C-E can fill them. For C-E Boilers are made in sizes and types for *any* capacity—for *any* pressure—*any* fuel or method of firing.

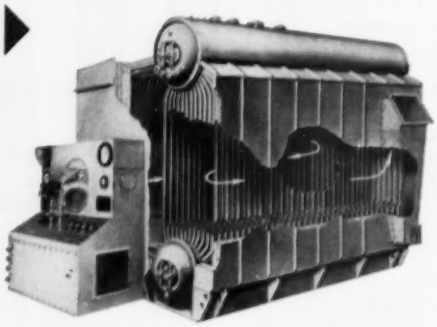


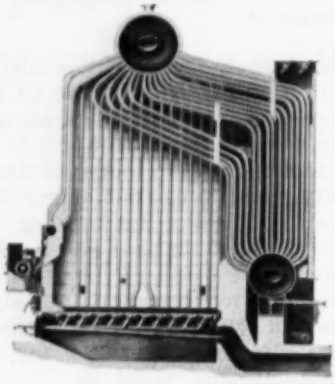
C-E Vertical Unit Boiler, Type VU-55

The VU-55 Boiler is available in six sizes ranging from 50,000 to 120,000 lb of steam per hr. It is designed for two pressure ranges—up to 250 psig and to 500 psig. These units are arranged for the application of superheater surface and heat recovery equipment if desired. VU-55 Boilers are designed for the pressure firing of oil or gaseous fuel and require no induced draft fan. They are equipped with tangential burners and tangent tube furnace walls to assure a level of performance which compares favorably with modern utility practice. The VU-55 Boiler is bottom supported requiring no supporting steel structure. The absence of exterior ductwork permits a smooth, streamlined exterior which is both attractive and practical.

C-E Package Boiler, Type VP

This completely shop-assembled boiler is available in fourteen sizes from 4,000 to 40,000 pounds of steam per hour . . . for operating pressures up to 500 psi . . . for pressure firing of liquid or gaseous fuels. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large lower drum—30-inch diameter—permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. A centrifugal fan, which operates at low speed and is exceptionally quiet in operation, is standard equipment. The simple baffle arrangement results in low draft loss . . . simple soot blowing . . . no dead pockets . . . high heat absorption. The VP is enclosed in a reinforced gas-tight, welded steel casing, and shipped completely assembled with firing equipment, fittings and forced draft fan. For foundation, it needs only a simple concrete slab.





C-E Vertical Unit Boiler, Type VU-10

The VU-10 is available in nine sizes from 10,000 to 60,000 pounds of steam per hour . . . for operating pressures up to 475 psi . . . superheat to 200° F in 20,000-60,000 lb range . . . for solid, liquid, or gaseous fuels. This boiler is a completely standardized design adaptable to many conditions. It is bottom-supported and needs no outside supporting steel. It operates efficiently over a wide range of output, and is easy to operate and to maintain. All parts are easily accessible for inspection. The VU-10 is a complete unit—boiler, furnace, setting, fuel-burning equipment, controls, forced draft, heat recovery equipment (if desired). Regardless of fuel, the same general cross-sectional arrangement of drums, convection bank and furnace wall cooling is used. Uniform design through each transverse section assures even water level in the drum and uniform expansion.

COMBUSTION ENGINEERING

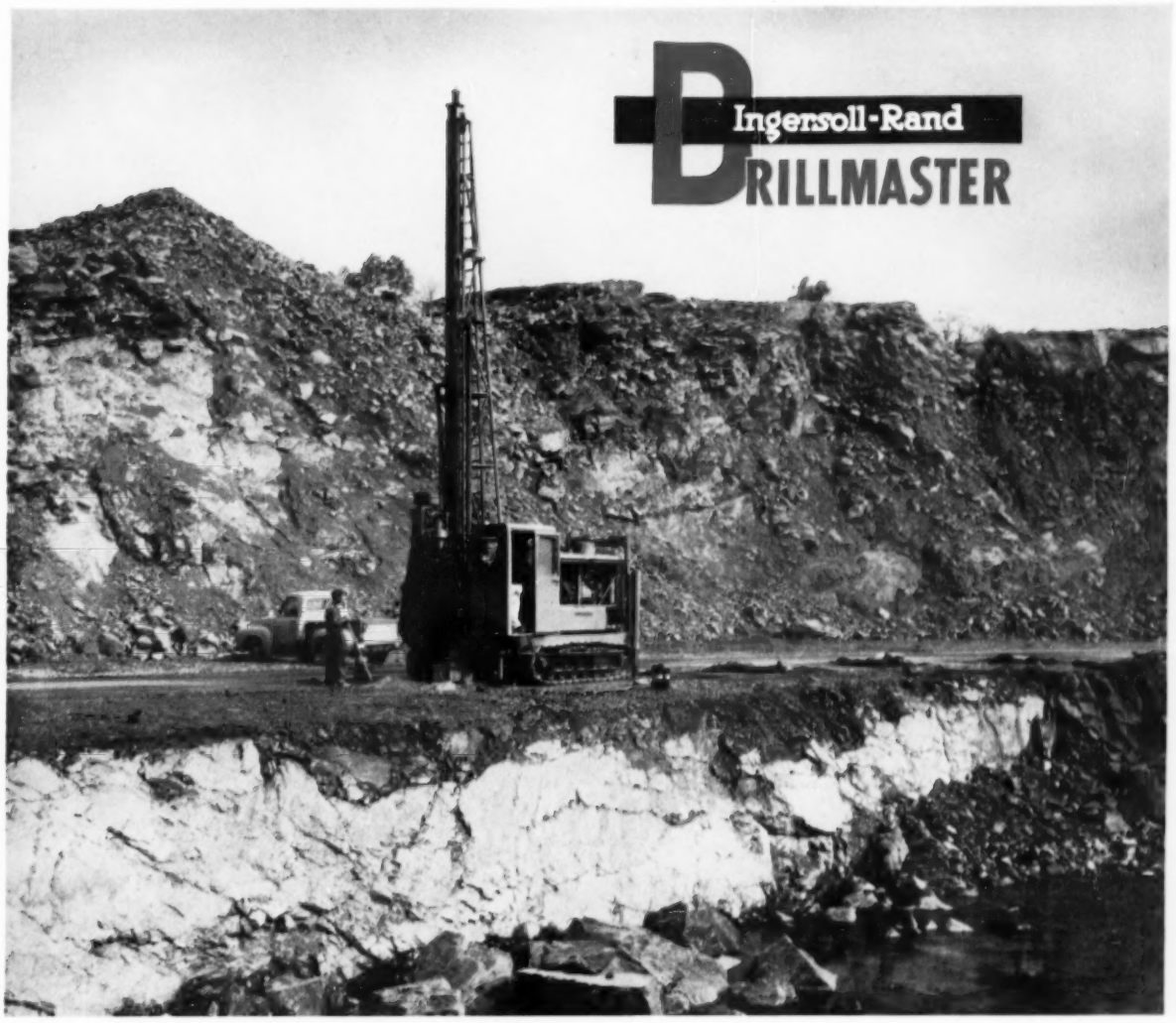
Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; DOMESTIC WATER HEATERS; SOIL PIPE

C-E

B-6528



increases drilling speed

from 30 feet to 200 ft per 9½ hr shift

Here at a large eastern limestone quarry, the Ingersoll-Rand Drillmaster shown above is sinking 6″ blast holes to a depth of 42 feet, at a rate of 200 ft. per 9½-hour shift. Previously, with other drilling equipment, footage averaged only 30 ft. per shift. The Drillmaster Carset Jackbits are giving 5,000 to 10,000 feet per bit, with 500 feet between sharpenings.

The unique "down the hole" Depth-Master drill, an exclusive Drillmaster feature, goes right down the hole with the bit—avoids power losses in long drill steels and applies the full drilling impact directly to the bit at any depth of hole. The three-way Drillmaster can also be used as a Rotary drill or with the Power-Master "out of the hole" drill when desired.

Ask your I-R representative for the complete Drillmaster story—or send for new Bulletin 4179.

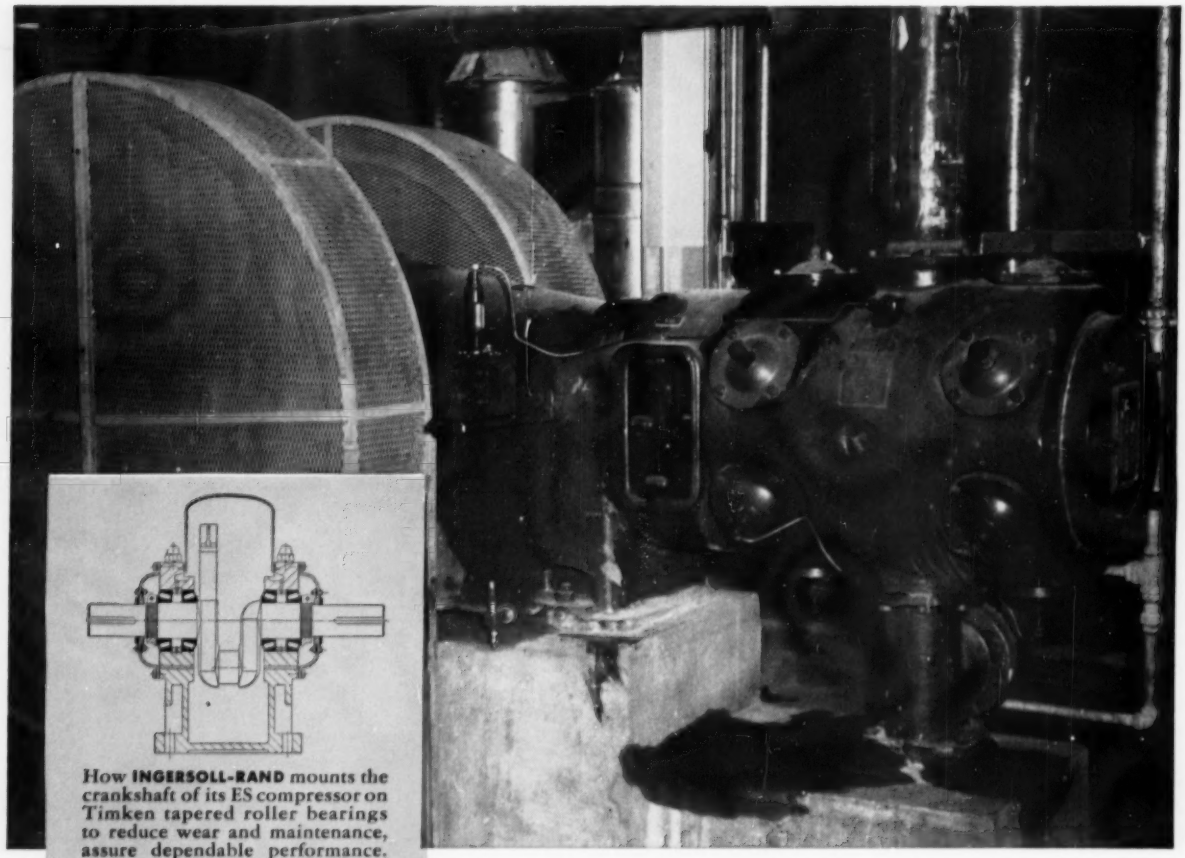
Ingersoll-Rand

11 Broadway, New York 4, N.Y.

5-325

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • PUMPS • OIL & GAS ENGINES

Circle 43A on reply card



How **INGERSOLL-RAND** mounts the crankshaft of its ES compressor on Timken tapered roller bearings to reduce wear and maintenance, assure dependable performance.

Steady supply of air, less wear, with TIMKEN® bearings on the job

THIS Ingersoll-Rand ES compressor supplies steady air in a plant of a major timber company. To assure dependable performance and minimize compressor wear, the crankshaft is mounted on Timken® tapered roller bearings.

The tapered construction of Timken bearings enables them to take both radial and thrust loads in any combination. The crankshaft is held in positive alignment. Wear on adjacent moving parts is held to a bare minimum. And bearing closures are more effective because Timken bearings keep housings and shafts concentric. Lubricant stays in; dirt stays out, further reducing maintenance.

Compressor power loss is less, because Timken bearings practically eliminate friction. They're designed to have true rolling motion, and precision-made to live up to their design.

Even Timken bearing steel is specially made. We make it ourselves—America's only bearing manufacturer that makes its own steel.

Only Timken bearings give you *all* these advantages. Make sure you get them in the machines you buy or build. Always look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ⊕ AND THRUST ←⊕→ LOADS OR ANY COMBINATION ⊕

REVOLUTIONARY BUCYRUS PLANT HELPS HOLD DOWN RISING COSTS

At a new plant in Bucyrus, Ohio, the Timken Company has substantially reduced the cost of tapered roller bearings by: 1) producing these bearings under a new system of extreme mechanization; 2) standardizing on 15 bearing sizes with the widest applications throughout industry. Manufacturers can take advantage of these lower costs by redesigning applications to use these Bucyrus sizes. And as more switch to Bucyrus bearings, production costs can drop still further, meaning even lower costs to you.

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